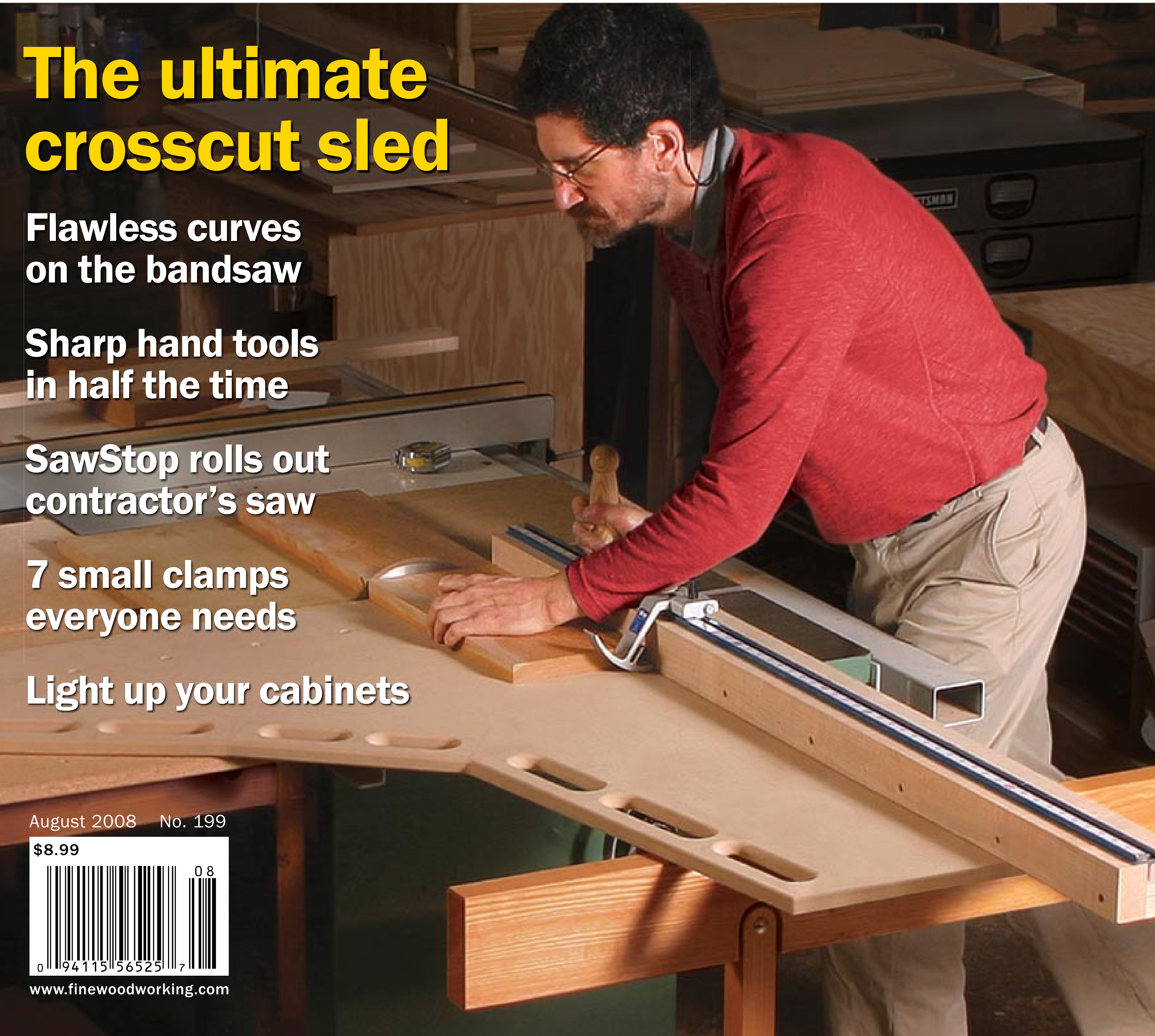
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# Fine WoodWorking

Build a Prairie settle, p. 40





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Cover photo: Steve Scott



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### Jigs for Smooth Curves

View a gallery of jigs that Michael Fortune (“Flawless Curves on the Bandsaw”) uses for his bandsaw wizardry.

NEW

### The *FWW* Video Podcast

Go behind the scenes with editor Asa Christiana to learn how the articles in this issue came together.



VIDEO

### Upholstering the Prairie Settle

Watch Kevin Rodel (“Build a Prairie Settle”) make simple but elegant cushions for his Arts and Crafts sofa.

AUDIO SLIDE SHOW

### Pro Portfolio: Joel Shepard

Take a closer look at Joel Shepard’s intricate cabinet (back cover) and listen to Shepard explain how his work is evolving.



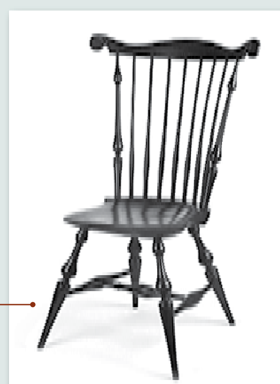
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Bert Wortel
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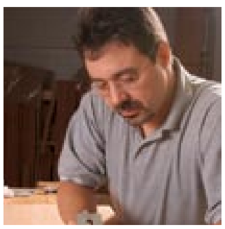
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**John McCormack** ***("Ultimate Crosscut Sled")*** **is a graduate of the Cabinet and Furniture Making Program at Boston's North Bennet Street School and has a master's in furniture design from the Rhode Island School of Design. Commenting on the radically different design traditions of the two schools, he says: "I consider myself a furniture-making ecumenist." He is also a long-distance solo kayaker who has paddled from Bellingham, Wash., to Prince Rupert, B.C. McCormack will give classes in July at NBSS on building the sled and its sawhorse. For details, go to www.nbss.org; for more on McCormack, go to www.johnpmccormack.com.**

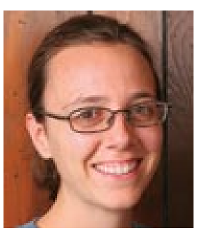




Several years ago, after deciding that Canada had at least one too many lawyers, **Hendrik Varju** *("Cut Your Honing Time in Half")* changed careers. Since then, he's devoted his energy to making custom furniture, repairing antiques, and teaching woodworking. His instructional DVD, "Jointer and Planer Secrets," is available at www.passionforwood.com. He lives outside Toronto with his wife and two children.

The period reproductions of **Jeff Headley** *("How to Tackle a Serpentine Drawer" and Master Class)* and his business partner, Steve Hamilton, grace offices and homes in the highest circles of Washington, D.C. Now the rest of us can enjoy their knowledge by taking woodworking classes at their shop in the Shenandoah Valley of northern Virginia. Go to www.wwotsv.com or call 540-955-2376.





**Sara Robinson** *(A Closer Look: "Spalted Wood")* is a graduate student at Michigan Tech University, in the state's Upper Peninsula. A woodworker since junior high, she has combined her academic interest in spalting with a small business selling bowls made from spalted wood with images from the northern forest burned onto them (http://northernspalting.com). Her goal is to collect the best and most colorful spalting fungi and market the colonized wood.

Since **Kevin Rodel** *("Build a Prairie Settle")* last wrote for us, he says he has gotten more gray hair (from glue-ups gone wrong) and moved his shop to downtown Brunswick, Maine. With the help of four local woodworkers, he recently designed and built the furnishings for the visitors center at the Coastal Maine Botanical Gardens. The piece in this issue was built for that commission.



For more information on our contributors, go to FineWoodworking.com/authors.

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# letters

## From the Editors



Garrett Hack

### REKINDLING THE SPARK

How do you stay excited about woodworking year after year? That might seem like a funny question to those of you who don't make a living at this as I do, those who are still discovering the joys of wood and new tools, with endless projects to build. But any of us can get bored making 18 paneled doors, or distracted by so many other ways to spend a weekend.

After three decades of working wood, I still can't wait to get into the shop in the morning. One of my secrets is to make sure each day is different. From finishing to turning, inlay, carving, and so on, furniture making is endlessly challenging and vast in scope. So push yourself with each project to try a new technique, attempt a new design, or use new materials. You'll be very engaged. Lately I've been forming some copper and brass feet, which I'll send out for gold-plating. It has been difficult but lots of fun. Experiment and try things you have read about. Maybe you get excited about devising new jigs or thinking up more efficient or better ways of doing typical tasks. New ways of working sometimes lead to frustration, but they keep furniture making interesting and fun for me.

My second tip is to get connected to peers. It's a great way to share knowledge and stay inspired. Join a guild, start your own woodworking group with friends, go to a conference such as the ones The Furniture Society and Colonial Williamsburg put on, or take part in an online forum. It will expand your awareness of all that's going on and spark some new interests. You'll find unusual sources for wood, parts for an outdated machine, or a new finishing recipe. And put your work out there in an exhibition. There's nothing like having your work seen by your peers to push you to do your best—because they know.

Even if you love woodworking, too much of a good thing can feel like another job. Long weeks burn me out. There are ways to enrich your woodworking without being in the shop. Spend a day at a museum, read about the history of furniture or art, take a walk and look at architecture, or visit that new home-design store in town. You never know where inspiration will come from. Breaks like these always bring me back to my work with new energy, new ideas, and a clear head.



—Garrett Hack is an acclaimed furniture maker and teacher, and a contributing editor.

### Mill lumber safely?

Was I the only one who noticed that an article named "Mill Lumber Safely" (*FWW* #196) contained a photo of someone ripping a board on a tablesaw without a splitter?

—JAY WEINSCHENKER, Whittier, Calif.

### SawStop's limitations

The SawStop tablesaw is a big step forward in safety, but it has significant limitations. And *Fine Woodworking* has not made these clear enough in recent reviews.

The system must be deactivated to cut wet pressure-treated lumber, foil-backed oriented-strand board (OSB), wood with staples, and any other electrically conductive material. When deactivated, it obviously can't do its job.

And when the system is triggered, it ruins both the brake cartridge and the blade. So a single inadvertent firing can cost you $200. Of course, a misaligned miter-gauge fence or a loose riving knife can also contact the blade and trigger the cartridge.

I'm sure there are those who will say that $200 is a small price to pay if it saves a finger. Maybe so … but there are many of us who have operated a tablesaw for decades without getting so much as a scratch.

—JOHN PITKIN, Greenville, Texas

### Alternative to pricey plywood

I certainly agree that the phenolic plywood discussed in "The Ultimate Shop Plywood" (*FWW* #198) is better than standard or Baltic-birch plywood, but I think you give it too much praise. The surface is not as thick or durable as the melamine available at home centers. If you need a better substrate than melamine-covered particleboard, the most durable jig surfaces and shop tables can be made by covering birch plywood with the thicker laminate used in countertops. Home centers offer great deals on partial and

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damaged sheets of laminate, and an entire sheet costs less than $50.

—ALAN SCHAFFTER, Washington, N.C.

### Sparks tell when grinding is done

In "Grind Perfect Edges Without Burning" (*FWW* #198), the author says to feel for a burr on the back side of the edge to know when to stop grinding the bevel. That will work, but so will simply watching the sparks. When they begin to come off the top side of the tool, the grinding wheel has reached the tip.

—BRUCE WRENN, Apex, N.C.

### Squeeze-out can lock up a panel

The Q&A on preventing squeeze-out in a mortise-and-tenon joint (*FWW* #198) overlooks a serious problem: preventing glue from getting on the tongue of a solid-wood panel. The photo shows some glue already on the tongue of the panel, which, if not removed, could fix the panel and not allow it to move with humidity changes. It only takes a measly amount of glue to cause the panel to crack. Worse, it will happen months later, when the piece is in a client's house (I speak from experience).

To prevent this, I always do three things with solid-wood-panel assemblies. First, round the corners of the panel tongue slightly—about a ⅛-in. radius. This is the point where glue is most likely to grab. Second, rub a little wax on the corners of the panel. If glue reaches the panel, it's less likely to stick. And finally, during the half-hour after assembly, shift the panel slightly within the frame once or twice. If any glue has migrated to the panel, this will break the bond before it sets.

—TONY O'MALLEY, Emmaus, Pa.

### Don't grind nonferrous metals

In "Master Class: Sculpt Your Own Hardware" (*FWW* #197), the author recommends using a grinder or a file

**YOUR TAKE**

## What is your favorite method for making tenons?

| | |
|---|---|
| 34% | Commercial tenoning jig for tablesaw |
| 12% | Shopmade tenoning jig for tablesaw |
| 12% | Dado set |
| 20% | Bandsaw and tablesaw |
| 11% | Handsaw |
| 11% | Other |

In our e-Letter, we poll readers on new questions each month. Sign up for the free newsletter at FineWoodworking.com.



to flatten the post. As a tool-and-die maker for the past 34 years, I know from experience that nonferrous metals such as aluminum, brass, bronze, and copper load up the pores of a grinding wheel, which can cause the wheel to expand and explode. The best tools for flattening those posts are a file, belt sander, or disk sander.

—LUTHER VANN, Columbia, S.C.

### Where can I get butternut?

I'm enjoying your "Getting Started in Woodworking" series (www.finewoodworking.com/start), but I think you've missed something. In Episode 5, you build a small box in butternut but don't say anything about where to get the wood, or how to get stock that is ½ in. thick. For those of us who don't live in a major city with a hardwood supplier, it would be very helpful if you could mention something about sourcing the materials for a project as well.

—JEFF NOYES, Macon, Ga.

**Asa Christiana replies:** Great point. We'll cover that in a future episode. In the meantime, a few words of advice: You might try online sources, but they usually have minimum-order requirements, for example, 6 board feet. For lesser amounts (like the small pieces this project requires), especially when you need custom thicknesses, you'll need to find a woodworking friend or a local retailer. You'll be surprised at how many small operations are lurking in all parts of North America. Finding a helpful local supplier, big or small, is an unavoidable part of the craft. And it is worth the cost to make a long drive and stock up on good material when you get there. Many suppliers will do some thicknessing for you, and most will let you buy one piece at a time.

Last, if you can't find butternut, do what the rest of us do: Just go with a nice wood that you *can* find.

### Update: Tansu hardware

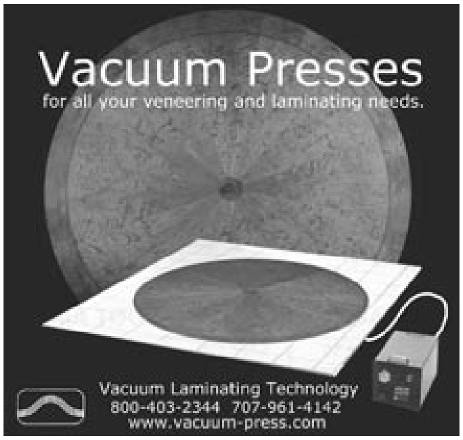
In the most recent Readers Gallery (*FWW* #198), there is a Japanese stair tansu by Matthew Stark with hand-forged hardware from Misugi Designs. That business has closed, and sent its stock to Hida Tool and Hardware Co. It is available in the hardware section at www.hidatool.com.

### Correction: Varnish recipe

In "Hot-Rod Your Varnish" (*FWW* #198), the recipe card misstated the proportions of the mixture. It should have read: 10 parts Pratt & Lambert No. 38 alkyd varnish, 10 parts pure tung oil, 2 parts Japan drier, and 2 to 3 parts turpentine.

## About your safety

**Working wood is inherently dangerous. Using hand or power tools improperly or ignoring standard safety practices can lead to permanent injury or even death. Don't perform operations you learn about here (or elsewhere) until you're certain they are safe for you. If something about an operation doesn't feel right, find another way. We want you to enjoy the craft, so please keep safety foremost in your mind.**




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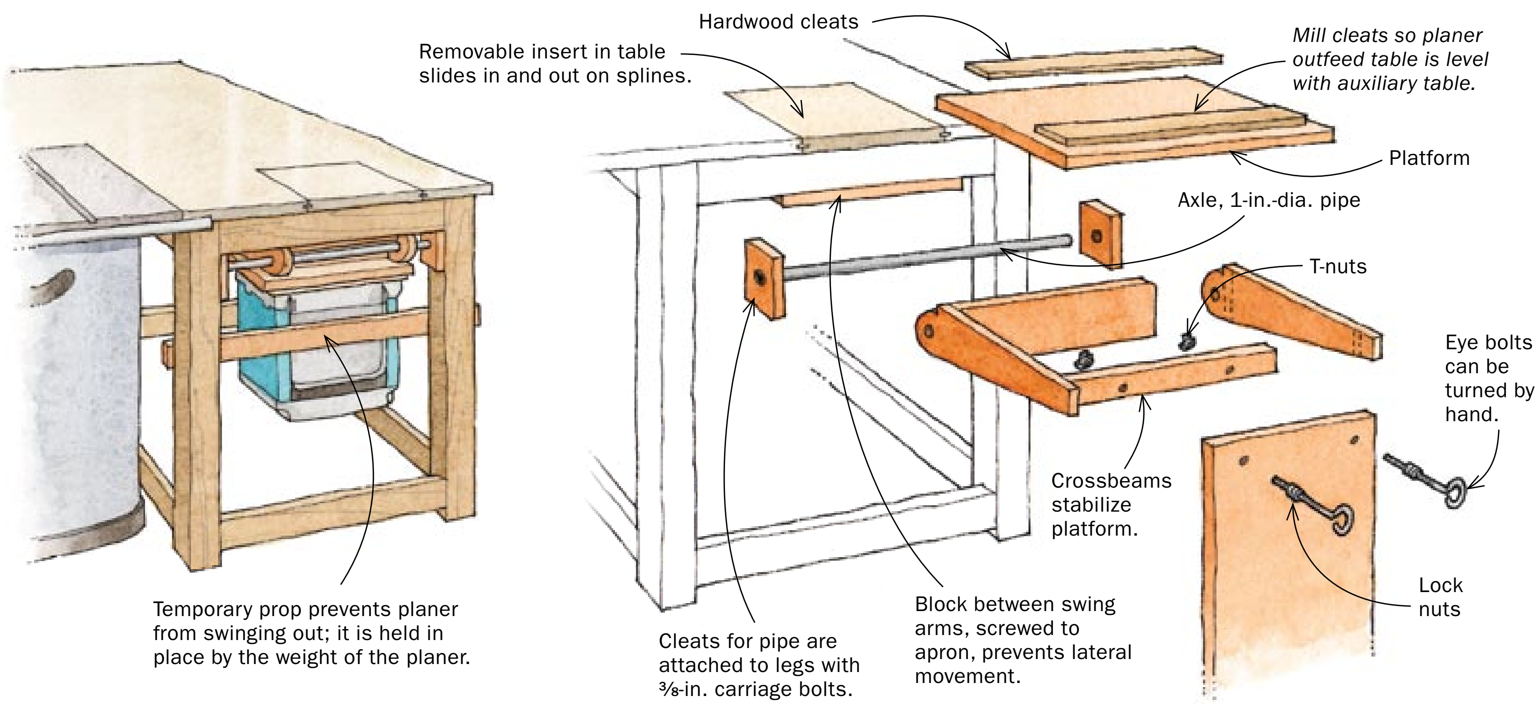

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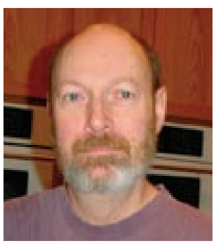

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READER SERVICE NO. 93




## Best Tip



**Now retired, John Wandling spends much of his time engaged in two of his favorite hobbies: fishing and woodworking. He's also a frequent visitor to the Knots discussion board at FineWoodworking.com, where he goes by the handle "Sequim Tool."**

# Hide-away planer table

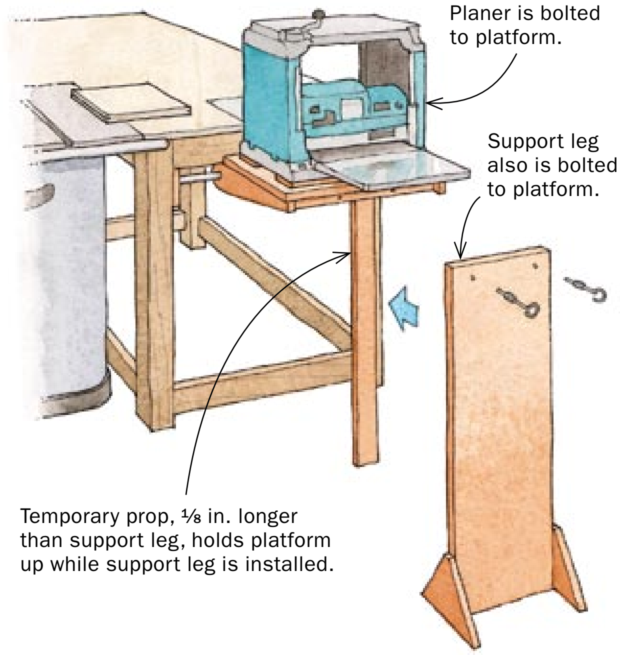
I built a flip-up table for my portable thickness planer right into the auxiliary outfeed table of my tablesaw. I can swing the planer up into working position and then down out of the way when it's not in use. This arrangement not only saves space but it also gives me several feet of supporting table on the outfeed side.

Most of the parts are made from ¾-in.-thick plywood. When it is up, the platform is supported by a plywood leg that bolts to the front of the fixture. To install the leg, I prop up the table with a support that's slightly longer than the leg, giving the leg plenty of clearance to slide into place.

The planer's outfeed table must be aligned with the auxiliary table, so take that into consideration as you calculate the axle location and swing-arm length. A simple approach is to design the platform so that it sits below the auxiliary table. Then mill up two cleats to a thickness that will bring the planer's outfeed table level with the auxiliary table.

When I'm through using the planer I install the temporary prop, remove the support leg, remove the prop, and rotate the platform and planer down. The temporary prop is stored between the auxiliary table legs and the planer to keep the planer from swinging out. Finally, I replace the removable table insert, and I'm ready to use the tablesaw.

—JOHN WANDLING, Sequim, Wash.






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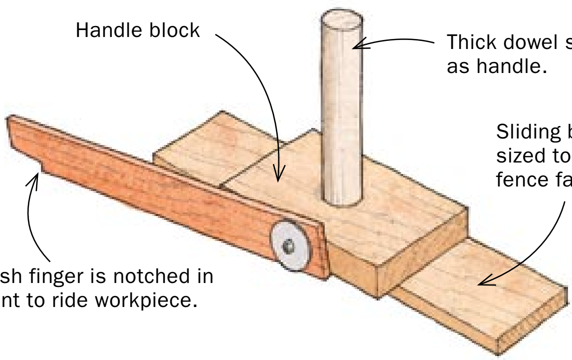

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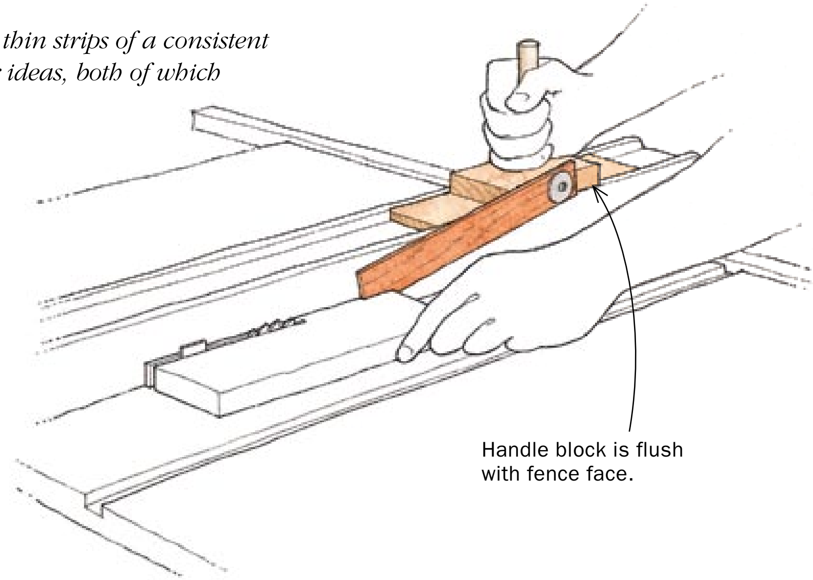



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## Simple methods for ripping thin stock on the tablesaw

*In* FWW *#194, David Diana presented a clever method for ripping thin strips of a consistent width. Since that tip was published, two of our readers sent in their ideas, both of which employ variations of the push stick.*




### PUSH STICK RIDES ON FENCE

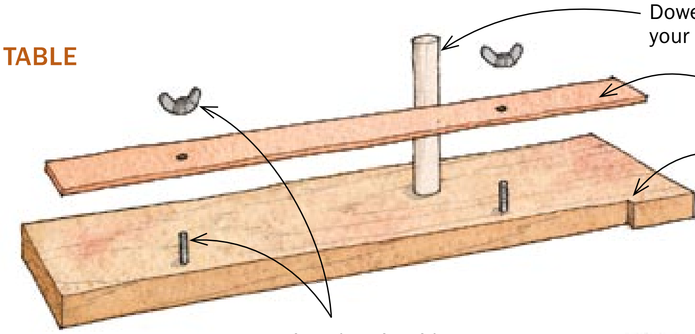
This push stick rides in the channel on top of a Biesemeyer-style rip fence. Though ideal for any rip cut, the design is especially useful when I need to rip thin strips of a consistent width.

The push stick consists of three main parts: the sliding block, the handle block, and the push finger. The sliding block should be milled so that it is slightly proud of the fence faces. The handle block is flush with the fence face that's close to the blade. The notched push finger is ¼-in.-thick hardwood, but a ⅛-in.-thick piece of aluminum would work as well. Attach the finger to the handle block with a screw and a large washer. The finger should slide against the rip fence.

To use, simply engage the workpiece with the finger and push through. When you're not using the push stick, just pop it off the rip fence.

—**JERRY OBERWAGER, Great Neck, N.Y.**

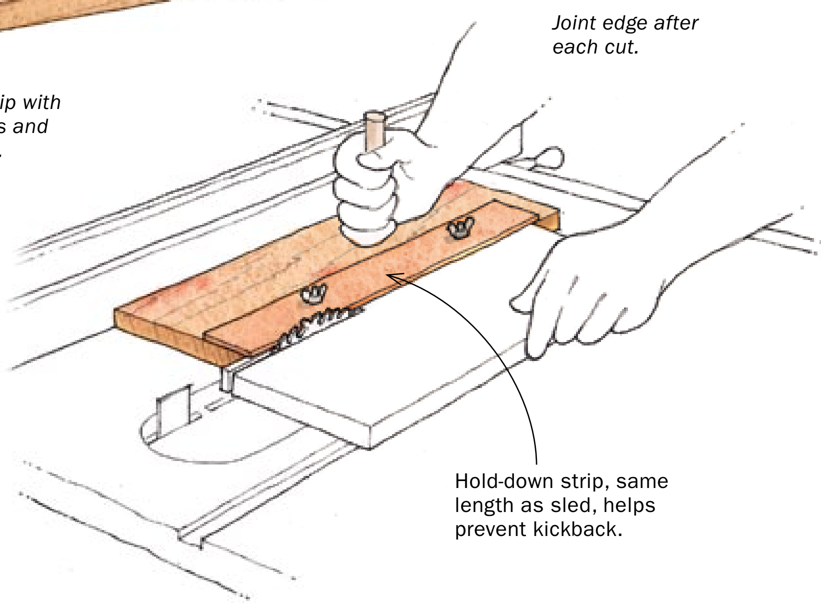
### PUSH SLED RIDES ON TABLE




This sled easily rips thin strips of consistent width without your having to reset the fence for every cut. The sled is a piece of ¾-in.-thick hardwood, 6¼ in. wide, with a ¼-in.-deep notch at one end. Install a 1-in.-dia. dowel handle about a third of the way from the back end and add a thin, 2-in.-wide hardboard hold-down strip to help prevent kickback. If your workpiece is thicker than the sled, shim up the safety strip with washers.

To use the sled, set the rip fence so that the desired strip thickness is left between the sled and the blade. Hold the workpiece with your left hand and slide it through. If desired, you can joint the freshly cut workpiece to get a smooth side on the next strip.

—**DAVID KILDAHL, Crookston, Minn.**




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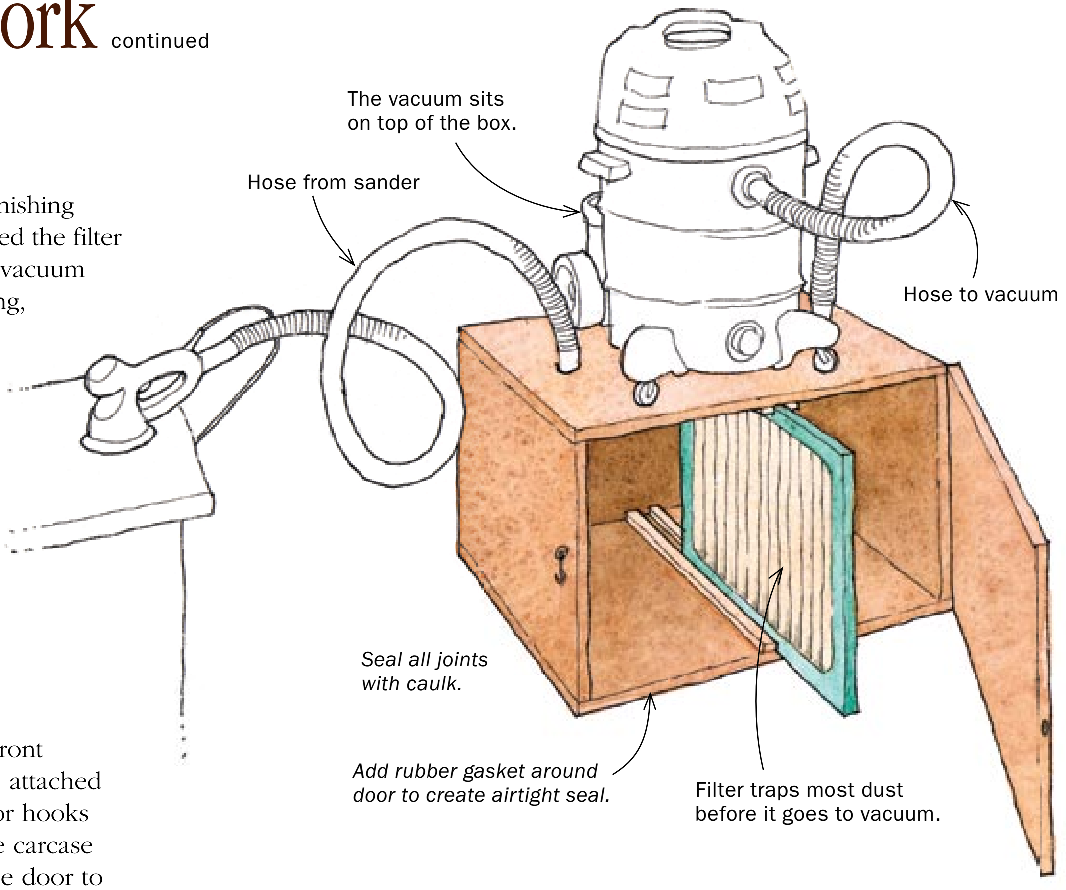



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## Shop-built sanding filter




We do a lot of sanding in our prefinishing shop, and the fine dust often clogged the filter on the shop vacuum. Cleaning the vacuum filter was messy and time-consuming, so I looked for an alternative. After considering expensive commercial filters, I decided to build my own out of medium-density fiberboard (MDF) and a 1-in.-thick fiberglass furnace filter.

Whatever size filter you choose (some are rectangular, some square) build the box around it for a tight fit. Holes in the top of the box receive the hoses from the sander and the vacuum, one on each side of the filter. The filter slides in from the front between wooden cleats. The door, attached with hinges, locks with screen-door hooks and eyes. I caulked all joints in the carcase and put a rubber gasket around the door to make it airtight.

I was surprised how well this simple and cheap device actually works. The vacuum filter still clogs, but now I clean it weekly instead of daily. A light tap on the furnace filter every few days helps keep it clear.

—DAN STANDLEY, Portland, Ore.

### Quick Tip

**I've hung a toilet-paper holder on my shop wall and keep a roll there. Goofy as it may sound, a wad of toilet paper is great for cleaning up glue ooze, wiping up sharpening oil, or removing a dribble of paint from the workbench. Plus, it creates lots of conversation when others first see it on the wall.**

**—JAMES D. MACDONALD, Wilmette, Ill.**

## Wood guard protects handsaw teeth

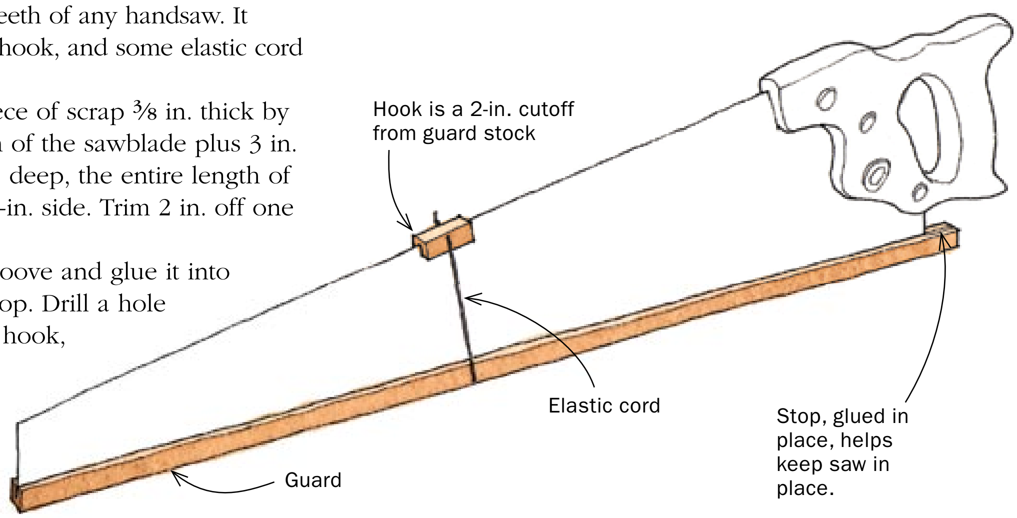
Here's an easy way to protect the teeth of any handsaw. It consists of a shopmade guard and hook, and some elastic cord (available at craft-supply stores).

To make the guard, first rip a piece of scrap ⅜ in. thick by ¾ in. tall. Then cut it to the length of the sawblade plus 3 in. Cut a groove, ⅛ in. wide by ½ in. deep, the entire length of the workpiece, centered on the ⅜-in. side. Trim 2 in. off one end. This will be the hook.

Cut a 1-in.-long plug to fit the groove and glue it into one end of the guard to make a stop. Drill a hole in the center of the guard and the hook, insert a short piece of elastic cord, and secure with a small knot.

To install, put the guard on first with the stop toward the handle. Then stretch the hook over the top of the blade.

—JONES L'ARGENT, Bend, Ore.





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■ MACHINES

# SawStop rolls out more affordable version

**FOUR YEARS AGO, SAWSTOP** introduced a 10-in. cabinet saw with a remarkable brake that could stop a spinning sawblade just milliseconds after contact with a wayward finger. Instead of an amputated digit, the saw operator would walk away with a shallow scratch.

Now, SawStop has added a second saw to its line, this one a contractor's saw. It has the same blade-safety brake and riving knife as its bigger brother.



***Knife safety.*** *In addition to the blade brake, the SawStop also has a state-of-the-art riving knife (left) to prevent kickback. The knife seldom needs to be removed, but it can be in seconds by flipping a lever (top).*



Both the blade-height and the blade-tilt mechanisms worked smoothly. Arbor-flange runout measured zero—as good as you can get. Blade-to-miter-slot parallelism was a tolerable 0.002 in. over 8 in., but it can be adjusted. Switching from the riving knife to a full blade guard required no tools and took just seconds.

On the downside, the saw's table was distinctly out of flat, with a crown of 0.011 in. at the insert opening. That's more than I like to see on a tablesaw top. In use, the saw ran smoothly. Under the table, the blade is partially enclosed in a plastic shroud with a 4-in.-dia. dust port. Connected to a dust collector, it captured at least 95% of the sawdust.

The $1\frac{3}{4}$-hp motor had plenty of power to rip $\frac{3}{4}$-in.-thick stock. I could also rip 2-in.-thick maple at a comfortable feed rate. But, like most contractor's saws, it bogged down when I tried to feed the thick maple at a fast pace.

To test the brake, I ran a hot dog into the blade twice, once with a regular blade, once with a dado-blade set. Both times, the brake fired flawlessly and the skin of the hot dog ended up with only a tiny scratch. The base model (includes 30-in aluminum rip fence and rails, stamped steel wings) sells for $1,500. For more information, go to www.sawstop.com or call 866-729-7867.

*—John White is the former shop manager at* Fine Woodworking.

**Online Extra**

To watch a video of the brake test, go to **FineWoodworking.com/extras.**



Photos: Staff

## ■ CLAMPING

# New clamp from Irwin




**WHEN I FIRST USED THE NEW** parallel-jaw clamp from Irwin, I was surprised at how good the handle felt in my hands. The handle has an oval shape, and the grip feels like soft rubber, making it easier to grip and crank than other parallel clamps.

No matter how much I tightened the clamps, the cold-formed steel bar refused to deflect. This might be because the clamps measured an average force of 575 lb. when *Fine Woodworking* tested them, about 15% less than Bessey's 675-lb. average.

The Irwin clamps have a removable plastic foot that helps level the clamp on your benchtop. Mounted on a cotter-pin assembly, the foot can be adjusted down the bar—which comes in handy when your clamp is longer than your assembly table—or removed completely.

With the foot removed, you can flip the clamp head and convert the clamp into a spreader, which is invaluable for safely disassembling joinery.

Expect to pay about $35 for the 24-in. clamp, $40 for the 48-in. version. Go to www.irwin.com for more information.

—Matthew Teague lives in Nashville, Tenn., where he builds custom furniture and writes about woodworking.



***New parallel clamps.*** *Irwin's parallel-jaw clamps have handles with a slip-free grip.*





***Sit or stand.*** *Oneway's new lathe lets you turn while either sitting or standing.*

## ■ TURNING

# Heavy-duty lathe from Oneway lets you work while seated

**A NEW LATHE FROM ONEWAY**, model 1236SD, works as a conventional stand-up machine, but uniquely, it also can be rotated 90° and used while sitting.

I tested the lathe while recovering from back surgery. Using a rolling stool, I found the sit-while-you-turn experience to be surprisingly comfortable. Wheelchair users should as well. In fact, I'd consider sit-down turning even if my back was problem-free. A jackscrew lets you raise or lower the 485-lb. lathe to a comfortable height just by cranking a wrench.

When sitting, though, as I quickly learned, there is one extra step: You need to regularly clear shavings from your lap.

Thanks to a 1-hp motor, the lathe had plenty of power and the electronic controls were smooth and efficient. The headstock has heavy-duty ball-bearings and a 24-position index.

To shift from stand-up to sit-down mode took two minutes at most. I just had to loosen two knobs at each end of the lathe and change out the tool-rest bases.

When turning a bowl, the tool rest had a somewhat limited range, so it had to be moved frequently.

The 1236SD sells for around $2,900. For more information, go to www.oneway.ca or call 800-565-7288.

*—Andy Barnum teaches wood turning at the State University of New York at Purchase.*

■ ACCESSORIES

# Jig sets any miter gauge to precise angles



***Angle setter.*** *The MiterSet lets you adjust a miter gauge to any angle up to 55° in ½° increments.*

**GOT A STANDARD TABLESAW MITER GAUGE,** the kind that is almost impossible to set at odd angles, let alone true 90° and 45°? The MiterSet is quick and easy to use, and it's accurate. The jig is beautifully simple: just a piece of laminate-covered birch plywood with 22 holes. The holes are divided by a slot that accepts a standard ¾-in. by ⅜-in. miter-gauge bar. Tapered-steel pins fit in the holes to establish positive stops at each 5° increment.

To set your miter-gauge angle (so the face of the gauge faces left), place a pin in the left-side 0° hole, then put the other pin in the right-side hole that gives you the angle you want. Loosen the miter gauge so it's loose on the bar, and then slip the bar into the slot in the jig. Slide the bar forward until the face of the miter gauge butts against both pins. Tighten the miter-gauge bar and you're ready to go.

The aluminum "step bar" that's provided allows the jig to assume any ½° angle between 0° and 55°.

To test the jig's accuracy and repeatability, I made 90° and 45° cuts and checked them. I also cut a couple of octagonal frames. After each cut, I reset the miter-gauge angle. Both frames went together perfectly with 22½° miters.

The MiterSet sells for $30. For more information, call 209-835-1626 or go to www.miterset.com.

*—Roland Johnson is a contributing editor.*



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# Precise tools for drawing curves

BY MICHAEL FORTUNE

I use all manner of curves to spring my furniture to life. Once I've nailed down the design, I like to create full-size drawings of any curved parts. These make it easier to transfer the pattern to a template or to the workpiece. Having accurate drawings of curved parts also makes it easier to visualize joinery details and ultimately to cut those parts.

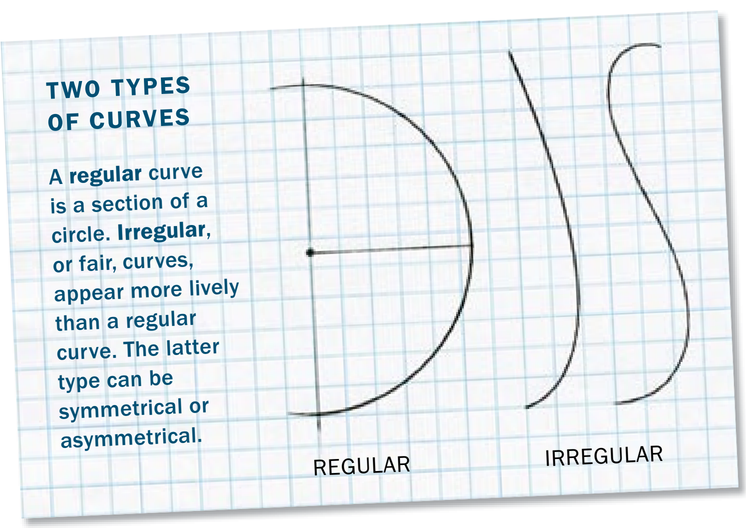
I'll show you how to draw both regular and irregular curves (see drawing, below), and then how to transfer those drawings to your work. My methods are simple and effective, and the tools involved won't cost an arm and a leg.

### Use a compass for regular curves

When drawing a circle or a section of a circle, it's hard to beat a compass for simplicity and accuracy. There are different types, and your choice will be based on the size of the arc you need.

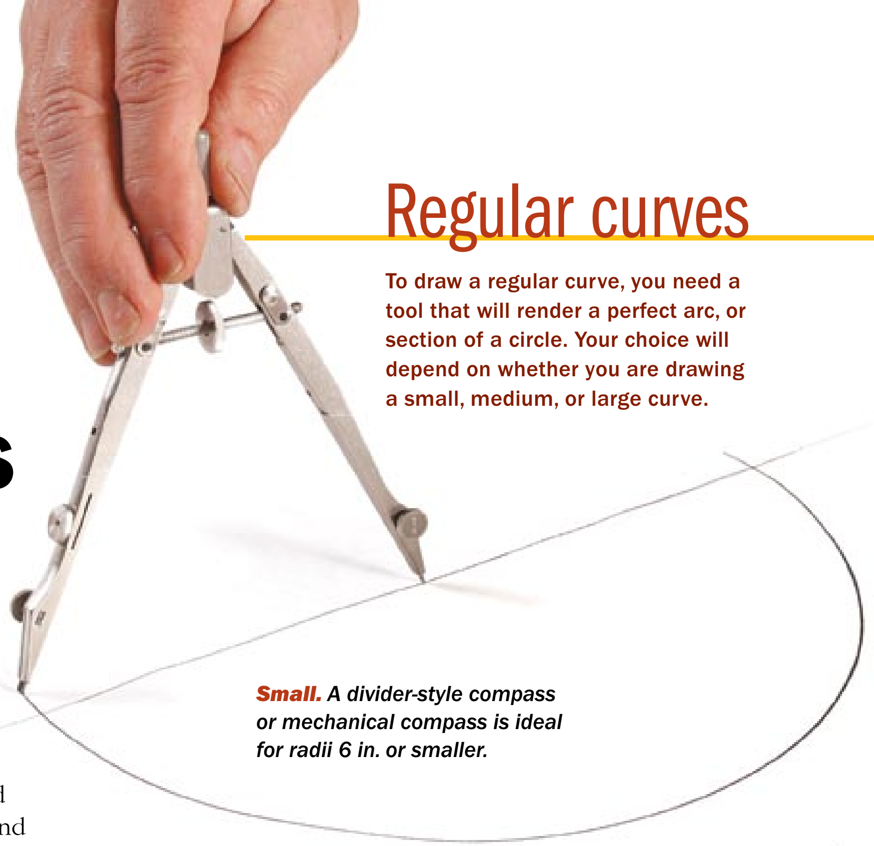
Small radii, usually up to 6 in., are best drawn with a divider-style compass. The most basic compass uses a standard pencil as one leg of the divider. These are available at office-supply stores and woodworking stores for as little as $3.

A mechanical compass is a more refined tool. Costing about $10 to $20 at office-supply stores, it uses a special pencil lead




## Regular curves

To draw a regular curve, you need a tool that will render a perfect arc, or section of a circle. Your choice will depend on whether you are drawing a small, medium, or large curve.



***Small.*** *A divider-style compass or mechanical compass is ideal for radii 6 in. or smaller.*



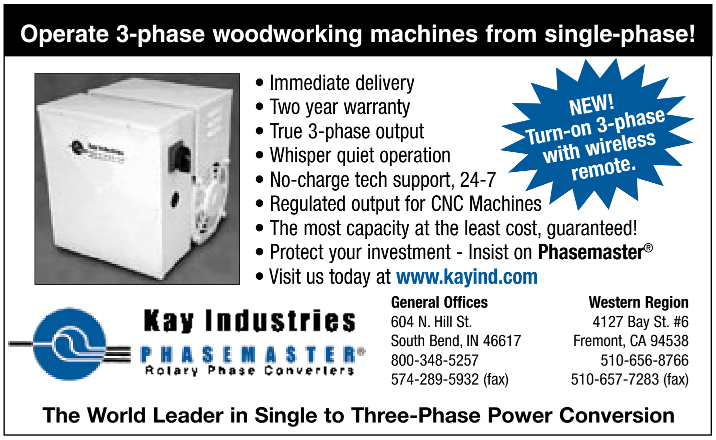
***Medium.*** *A beam compass is a two-part drawing tool that attaches to a strip of wood. It can render curves from 1 in. to several feet in diameter.*



***Supersize.*** *Heavy-duty beam compasses are attached to thicker stock to draw ultralarge-diameter arcs.*



Photos: Thomas McKenna



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# Irregular curves

**Irregular curves appear more natural to the eye, and it takes some specialized tools to draw them.**



***Small.*** *Use french curves to render small details such as door handles or knobs.*



***Large.*** *Drawing bows, both symmetrical (yellow) and asymmetrical (green), are bent into shape by tensioning and locking the strap.*



***Parallel.*** *To add thickness to a curved part such as a drawer front, you need to draw two lines that are evenly spaced apart. Simple metal washers or shopmade MDF versions work well.*

in a holder that's sharpened along the outside at a 30° angle. To maintain that point, you can use a fine-grit sanding block or a sharpening stone. Choose a hard lead (2H), which will hold its point longer than soft lead and will render a finer line.

Beam compasses, or trammels, are used to draw radii from 1 in. to many feet. A beam compass has two separate heads that are mounted on a beam, usually wood. One head has the radius point and the other holds the lead or scribe that draws the arc. Again, use a hard lead and sharpen it in the same manner as the lead in a mechanical compass.

You can buy more robust beam compasses (available from www.toolsforworkingwood.com or www.generaltools.com) that can be attached to thicker, sturdier beam stock, allowing you to draw large arcs with radii from 5 ft. to 10 ft. These are ideal for working with curved dining tables or other large pieces.

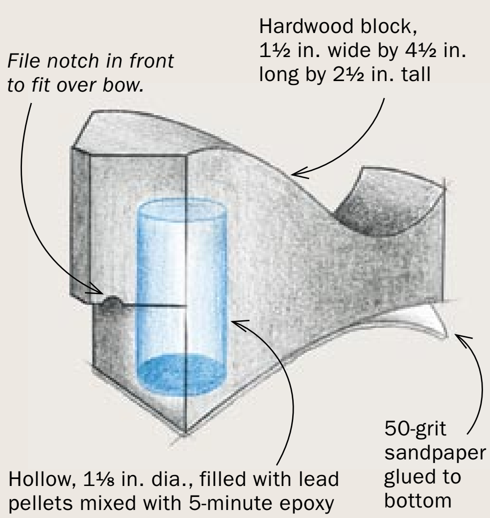
## Use french curves and bows for irregular shapes

Small irregular curves, such as those found on the feet of cabinets or on door handles, can be drawn using french curves. They are made of plastic and are often sold at art-supply stores in sets of three (the largest is 12 in. long) for about $10.

For larger irregular shapes, I have come to rely on easily

### WHALE OF A HOLD-DOWN

**These weighted hold-downs are easy to make, but if you prefer, you can buy them online from boatbuilding supply stores (search for "spline weights").**






***Heavy helping hands.*** *It's tough to hold the bow and trace a line at the same time. If you don't have a helper, use spline weights, often called whales by boatbuilders, to keep the bow still as you scribe the curve.*





Drawings: John Tetreault

# From paper to project

**To transfer full-size drawings to a blank, you can stick the pattern right on the piece, trace the shape over carbon paper, or reproduce the shape using a drawing bow.**



***Attach the pattern to the workpiece using spray adhesive.*** *This method works especially well when making templates from MDF or hardboard, but avoid using it on the actual workpiece. The glue makes the surface gummy and may cause problems with finishes. Use double-sided tape instead.*





***Retrace using carbon paper.*** *Tape the carbon paper and pattern to the workpiece and simply trace along the lines firmly. When you lift off the paper, the pattern is perfectly reproduced.*





***Don't have carbon paper? Try this.*** *Use a soft lead pencil to shade over the lines of the drawing on the back. Then tape the pattern to the workpiece and retrace.*

adjusted drawing bows. The bow has a stick that's bent under stress and held in that shape with a string or strap. This versatile tool works for both symmetrical and asymmetrical curves. Drawing bows do not generate a consistent radius; instead, the curve is always straighter at the ends than in the middle.

I've been making my own wooden bows for years. But these bows tend to develop a kink or two and a twist along the length over time. Drawing bows made with carbon-fiber-impregnated plastic are much more consistent and reliable than the shopmade wood versions. Lee Valley (www.leevalley.com) sells two versions: asymmetrical and symmetrical. The stick of the asymmetrical bow is tapered in thickness to generate the asymmetry.

### Re-creating shapes on the workpiece

Once you have the drawings done on paper, you need to get them to the workpiece. I like to draw my pieces full size, so transferring is fairly easy to do.

One way is to attach the drawing directly to the workpiece using spray adhesive. Then simply cut out the pattern following the drawing. This technique is great for making templates, but unless you make a copy of the drawing, you lose it.

Another way is to lay a sheet of carbon paper on the project and tape the drawing in place on top. Then it's a simple matter of retracing the lines. A variation of this involves scribbling with a soft pencil lead (HB, 2B) on the back of the drawing and retracing the pattern on the workpiece (see photos, bottom left).

My favorite method of transferring irregular curves from a full-size drawing is using the drawing bow. I reconstruct the important straight lines (as reference lines) on the project or template. Then I stretch the drawing bow to the appropriate shape, use a pencil to mark the tangent, or end, points of the curve on the bow, and move it to the workpiece, aligning the end-point lines with the straight lines on the project (see photos, right).

Once you have the pattern in place on your workpiece, you can move to the bandsaw and start cutting the curves. (For more on this, see my article on pp. 34-39). □





***Re-create the curve using a bow.*** *First find the curve's end points (where the curve meets a straight reference line) on the pattern and transfer those to the bow (top). Next, re-create the reference line on the workpiece (or use a straight edge of the piece), align the marks on the bow with the reference line, and trace the shape.*

# Spalted wood



## LEARN HOW WOOD AND FUNGI INTERACT— THEN CREATE YOUR OWN BEAUTIFUL BOARDS

BY SARA ROBINSON

Any product associated with rot and decay is likely to have an image problem. Spalted wood is no exception: You're more likely to find it in your firewood pile than in your local lumberyard.

However, a growing number of woodworkers are looking past the decay and discovering the beauties of spalted wood. These include colors not normally found in wood, contrasting light and dark colors adjacent to each other, and most notably, brown and black lines running through the wood. Unique to spalted wood, these lines can range from one or two running down a board to something resembling contour lines drawn by a drunken mapmaker.

Best of all, like fingerprints, each board of spalted wood is unique. It is this diversity that has drawn me to study spalting academically and to use it as a wood turner. I'll talk about how spalting occurs in the wild and how you can try to re-create this process under controlled conditions at home. Finally, I'll give some tips for working with spalted wood.

### A fine line between beauty and decay

Spalting, the coloring or bleaching of wood by fungi, can happen to any kind of wood, but various conditions determine whether the result is a prizewinning specimen or a punky lump. These include the types of fungi that colonize the wood, how long the fungi remain there, the interactions between different types of fungi, and the type of wood itself.

There are three main types of spalting in hardwoods: white rot, pigment (commonly referred to as stain), and zone lines. Softwoods generally don't produce usable spalted wood as they are more susceptible to brown rot, which often degrades the wood too quickly for use.

**White rot is fast but hard to control**—White-rot fungi give spalted wood its white appearance by bleaching the lignin found in the walls of wood cells. However, these fungi also reduce the strength and weight of the wood.

One of the most common white-rot fungi is *Trametes versicolor*. Commonly known as turkey tail, it grows on dead hardwoods in a fan shape in overlapping rows, and has



***Just for show.*** *Because spalted wood may have lost some strength, it's best for non-load-bearing locations such as floating panels. This cabinet, built by Chris Gochnour, uses book-matched panels of spalted maple.*

### TYPES OF FUNGI



***Turkey tail for fast spalting.*** Trametes versicolor, *commonly known as turkey tail, grows on dead hardwood across much of North America. A white-rot fungus, it bleaches the wood quickly, but causes too much decay if not stopped in time.*



***Pigment fungi color the wood.*** *These color wood pink, blue, green, or orange. Like most pigment fungi, this green* Chlorociboria aeruginascens *grows on the inside of the tree.*



***A source for black lines.*** *Dead man's finger is the apt name for this fungus, which can be found growing on stumps of hardwood trees. It causes the dark lines that are often found on spalted wood.*

Photos, except where noted: Mark Schofield; second from top: Sara Robinson

## Spalt your own







***Keep the wood damp.*** *To help maintain an even dampness around the boards, pour in and then wet some vermiculite (left). Lay dampened boards in the container and place pieces of fungi in contact with them (center). Then cover the boards with more damp vermiculite and put a loose lid on the container. After six weeks, remove a sample block, clean off the vermiculite, and inspect the amount of spalting (right). Check every two weeks until there is enough.*

alternating colored bands of brown, blue, yellow, red, or black. It can be found from July through October in North America. *Trametes versicolor* is an aggressive colonizer, making it fantastic for spalting due to its quick growth, but care should be taken not to let it decay the wood past a usable state.

**Pigment fungi can be hard to locate—**Blue-stain fungi are the most common types of pigmentation, but there are other fungi that impart vivid hues of pink, green, and orange. Most of these brightly colored fungi are secondary colonizers, meaning they can only spalt wood after another fungus has gone through and taken away some of the wood's natural barriers.

Pigment fungi can be allowed to spalt wood for much longer than white-rot fungi, and not as much care is needed to ensure the continued stability of the wood.

Pigment fungi in the genus *Ceratocystis spp.* don't have an easily recognizable fruiting body, like a mushroom, so often the only way to find them is in fallen timber. If you see wood with blue stain, gather shavings or sawdust for do-it-yourself spalting (see below).

**Lines usually need two or more fungi—**Thin, winding lines of black, red, and sometimes brown that streak across wood are known as zone lines. They form when one fungus erects a sort of wall to protect its resources, or when two or more fungi antagonize each other.

*Xylaria polymorpha* (dead man's finger) is probably the most well-known fungus that causes these zone lines. It grows worldwide on decaying hardwood and generally resembles a cluster of black "fingers" growing up out of a stump or log. This fungus can erect zone lines on its own, but also puts them up quickly when another fungus is near.

### DIY spalting

Spalting wood is a lot like growing plants. With the right amounts of food, water, and heat, you should end up with good results, but success is by no means guaranteed.

Rather like home cooking, every result is likely to be slightly different.





***Nasty to nice.*** *After removing the spalted board from the vermiculite, allow it to air-dry. When ready to work, lightly plane or sand the surface and apply a clear finish to display the spalting.*

First, pick your wood. Maple, birch, and beech are ideal, as their pale colors act as a blank canvas. Due to its hardness, maple is especially good because areas that receive too much spalting won't turn as soft as, say, a piece of aspen.

Air-dried wood comes already laden with dormant spores of different fungi, so there is no need to introduce more spores. Kiln-dried wood is more hit-and-miss because steam sterilizing will kill all the spores, but regular kiln-drying may kill only some of them. In either case, to be on the safe side, you'll need to obtain fungal spores, either by collecting them out in the woods or checking your firewood pile for spalted wood. If the piece is too small to make anything out of, you can cut the wood and use the sawdust or shavings for your spalting experiments.

**Bag it or bin it—**The ideal conditions for spalting are darkness with around 80% humidity and 80°F temperature. To achieve these




conditions, you can place the wood in either a plastic bag (but don't seal it, because the fungi require oxygen) or a plastic storage bin. These bins are not airtight and they come in a variety of sizes. If you use a plastic container, it's advisable to pack some sort of filler around the wood to help prevent moisture loss. Vermiculite, a dry, flaky soil additive available at garden-supply centers, is a relatively clean material.

Finally, break the fungi into small pieces and place them on the wood. The board does not need to be covered completely; however, the more places you stick some spores, especially on the end grain, the quicker the piece will spalt. Place the bin somewhere warm and dark, and wait.

The amount of time it takes for a piece of wood to start spalting will vary by species, fungi, temperature, and the size of the piece. Because moving the wood slows the spalting, it is best to place a few small sample pieces of wood in the container at the start of the experiment. Starting at six weeks, remove a block every two weeks to check it for softness and color. If you like what you have, remove the board from the bin or bag. If not, wait another two weeks and check again.

Once you remove the spalted wood from its container, make sure to air-dry it before use (unless you will be turning it that day). The fungi will continue to colonize the wood until the moisture content drops below 20%.

#### Working with spalted wood

There is a misconception among many woodworkers that working with spalted wood is particularly dangerous. Most fungal spores are about as harmful to a healthy adult as wood dust, so if you sand spalted wood, wear a mask. However, people with immune system disorders should *not* work with spalted wood.

Because areas of heavy white rot are likely to be softer than regular wood, when handplaning, use a low-angle blade to slice through the wood. When turning, pockets of rot can cause dig-ins and uneven sanding in the final product. If areas of the wood are spongy, or if there are small splotches of white throughout the piece, you might want to stabilize those areas with a two-part, five-minute epoxy resin or cyanoacrylate glue.

It's a good idea to turn spalted wood when it is green because the whole piece is soft, which minimizes the difference in hardness between spalted and unspalted areas. Because the grain rises as the wood dries, sanding is most efficient after the wood has dried.

Finally, softer areas of spalted wood will soak up finish, so it may take several extra coats before the cells become saturated. While you'll probably spend a bit more time shaping and finishing spalted wood than traditional lumber, the end results are well worth it. □

## Turning spalted wood

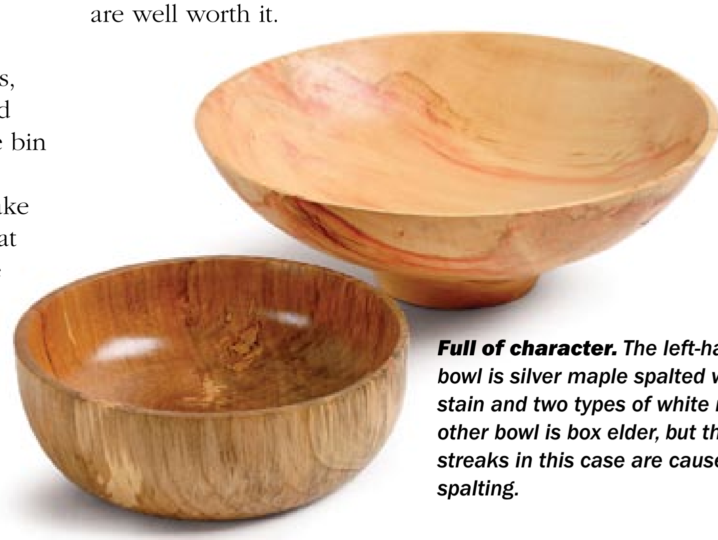
**Turning is a great way to display spalted wood. You can turn dried blanks, but green wood has a more consistent density.**



***Reinforce soft areas.*** *Wood that has been softened by fungi can be hardened by soaking it with cyanoacrylate ("Super") glue. The glue won't show after a finish has been applied.*



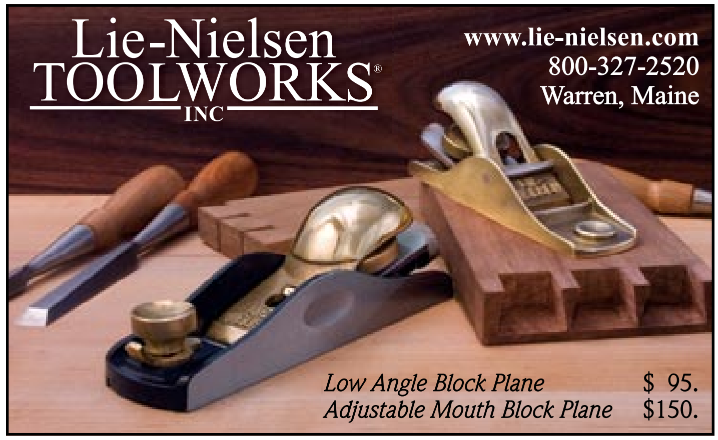
***Controlled sanding.*** *Some sections of spalted wood are softer than others, so it is better to use foam sanding pads on a drill press rather than sanding the work while it is on the lathe.*



***Full of character.*** *The left-hand bowl is silver maple spalted with blue stain and two types of white rot. The other bowl is box elder, but the pink streaks in this case are caused by spalting.*



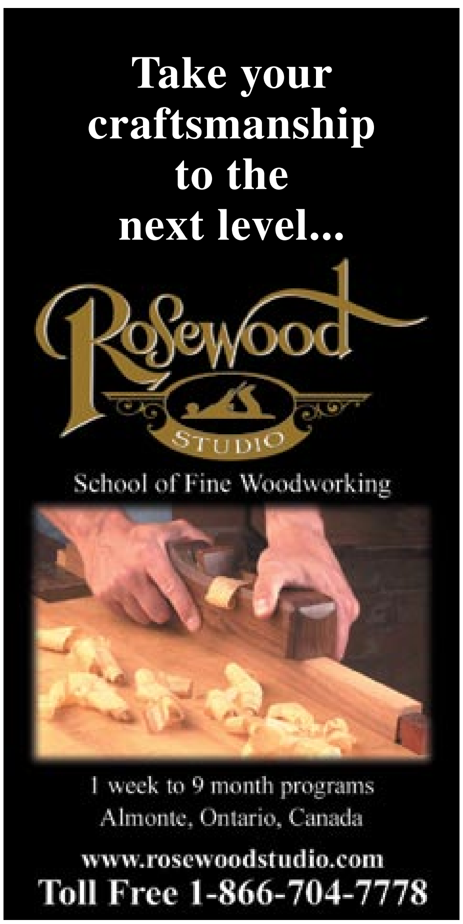

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# Flawless Curves on the Bandsaw

Tricks and tips for surprisingly smooth cuts

BY MICHAEL FORTUNE



I have exhibited my work for many years and have noticed that people respond to curves. They'll stop, look, and then run their hands along the curved edges of a piece. Square furniture rarely invites this personal interaction.

I use all manner of curves in my work, from irregular, free-form curves to regular curves with exact radii. All of them must be free of irregularities that could catch the light unevenly or be easily detected when you pass your hand along the edge. The fastest way to cut curves is on the bandsaw. The bandsaw is a crude machine, however, and the results can be rough, with major smoothing and sanding required. I will show you how to cut curves on the bandsaw so smooth and close to the line that they require very little cleanup afterward.

The first step to cutting attractive curves, whether true arcs with a single radius or irregular, flowing curves, is knowing how to draw them. I cover that in Fundamentals on pp. 24-28.

### Start with the blade and guides

A 14-in. bandsaw is a good size for cutting curved furniture parts. The key to great

**Online Extra**

To see the jigs Fortune uses to cut circles and identical curves, go to **FineWoodworking.com/extras.**

Photos: Thomas McKenna

# Success starts with setup

## MATCH THE BLADE TO THE CURVE



***A coarse blade for a smooth cut.*** *For all bandsaw cuts, including curves, a coarse blade like this ½-in., 3-tpi model will run cool and track a line more effectively than a fine blade. The finer blade will run hotter and will clog with sawdust quickly, making it wander.*

| BLADE SIZE | MIN. RADIUS |
|---|---|
| ⅛ in., 14 tpi | ⅛ in. |
| 3⁄16 in., 4 tpi | ⅜ in. |
| ¼ in., 4 tpi | ⅝ in. |
| ⅜ in., 3 tpi | 1¼ in. |
| ½ in., 3 tpi | 2½ in. |
| ¾ in., 3 tpi | 5 in. |



Tighter curves require narrower blades. For example, a ½-in.-wide blade won't make it around a 1-in. radius.

performance is picking the right blade for the job and setting up the saw properly.

**Pick the right blade—**It might seem counterintuitive, but a coarse blade (3 tpi to 4 tpi, skip tooth) will make very clean cuts. A finer blade, with too many teeth and small gullets in between, will clog with sawdust pretty quickly, causing it to overheat and dull prematurely. The blade will also tend to dodge left or right as it works to avoid the compressed sawdust, resulting in a wobbly cut line.

Be sure to match the blade width to the radius you are cutting (see chart, above). In general, tighter curves require narrower blades. Finally, be sure the blade is sharp and clean. A dull blade will always seek the path of least resistance, and it is rarely in the direction you want to cut. You can tell a blade is getting dull when it takes extra pressure to cut the stock. A dull blade also runs hotter, and the end of the kerf will be dark where the teeth were in contact with the wood. You may also notice that the sawdust appears slightly toasted.

**Set the tension and guides—**Once you have the proper blade in hand, it's critical that you set the tension and guides to ensure good results.

With the guides pulled away from the blade, adjust the tension and track the blade so that it's centered on the upper wheel (for details on setting up the bandsaw, see "Five Tips for Better Bandsawing," *FWW* #173). I do not overtension bandsaw

## BRING THE GUIDES CLOSE TO THE BLADE

To keep the blade from twisting excessively during a curved cut, it's critical that you keep the guides and thrust bearing close to the blade.



***Paper-thin gap.*** *Space the guides about 0.001 in. (about the thickness of tracing or cigarette paper) from the sides of the blade. Also, the front of the guides should align with the back of the blade's gullets.*



***Adjust the thrust bearing.*** *Move the bearing within 1⁄32 in. of the rear of the blade. Fortune uses a thin rule as a gauge.*



***Square the table to the blade.*** *The sides of the blade should sit flush against the blade of the square.*



blades. In fact, I lean toward undertensioning them. For example, my ½-in. blades will be tensioned only to the ⅜-in. mark on the blade tension scale. The lower tension works because the coarse blades I use cut flawlessly and are easy to steer along a pencil line. The lower tension also saves wear and tear on the bandsaw tires and doesn't overstress the frame of the bandsaw. Overtensioning a narrow blade, such as the ⅛-in., 3⁄16-in., and ¼-in. sizes, risks having the blade create a groove in the tires. Once that happens, any blade will become almost impossible to track.

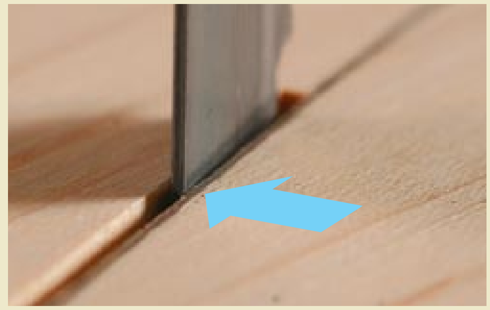
Next, adjust the guides and the thrust bearing to ensure sufficient blade support for the curved cuts. Finally, check that the table is square to the blade, lower the upper guide to within ½ in. of the workpiece—enough to block your fingers from passing under—and you're ready to cut.

### Cutting close to the line means less cleanup later

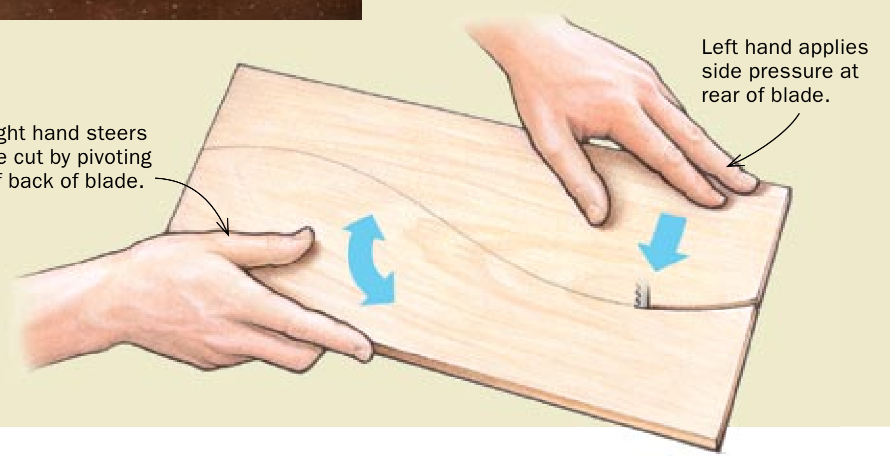
An essential woodworking skill is being able to cut to a curved line on the bandsaw. I see a lot of students and beginning woodworkers struggle with this task. I'll show you the secrets to making smooth cuts within 1⁄32 in. of any cut line, without the need for fancy jigs.

## Smooth cuts guaranteed

### A LITTLE TWIST MAKES ALL THE DIFFERENCE

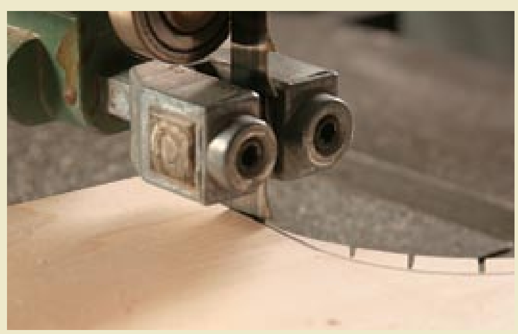


***Use the back of the blade to steady the cut.*** *A bandsaw blade typically leaves a bumpy surface in its wake. But by lightly twisting the workpiece so that the back of the blade rides along one side of the kerf, you can make a smooth cut and control the blade's path with marksman-like precision. What side of the kerf you press on will depend on the direction of the curve.*




### USE RELIEF CUTS TO CHEAT





***How to bandsaw a radius tighter than a blade will allow.*** *First remove the bulk of the waste (left). Next, make the relief cuts perpendicular to the cut line. The number of relief cuts you make depends on the severity of the curve. Now you'll be able to remove the rest of the waste along the line, steadying the workpiece against the back of the blade (above).*



Drawings: Christopher Mills

## CUSTOMIZE YOUR BANDSAW TABLE

A simple auxiliary table can help support large workpieces and can prevent tearout on thin stock.

### MAKE A BIGGER WORK SURFACE





***Got MDF?*** *By clamping a larger table to the bandsaw table, you can support a workpiece and its offcuts throughout the cut.*



### USE A ZERO-CLEARANCE TABLE FOR THIN STOCK





***No tearout allowed.*** *A piece of 1/8-in.-thick hardboard supports the workpiece and reduces tearout as the blade exits the cut. Use double-sided tape to attach it to the table.*

**Let the blade do its job—**When cutting, don't push too hard. Feed the workpiece slowly and steadily. With a sharp blade, the work should practically feed itself. Trying to make the blade cut too fast will create a rough surface and a wandering cut.

It's also helpful to have good task lighting focused on the cutting area so the pencil line is clearly visible. As you cut, always be aware of where your hands and fingers are. It's easy to lose track of them as you navigate the curves.

Plan the sequence of any curved cut so that it is not necessary to back out along the curved kerf. Backing out can be problematic, especially if the kerf has closed up, and you risk inadvertently pulling the blade off the bandsaw wheels.

**A really twisted trick—**The most common problem encountered when cutting a freehand curve is that the cut is wavy and not always precisely parallel with the line you want to follow. The set on the blade's teeth (the distance the teeth project from the sides of the blade) allows the wood to move from side to side until it encounters the flat sides of the blade.

I found a way to overcome this problem by slightly twisting the wood during the cut so that one side of the kerf remains in contact with the back edge of the blade (see photos, facing page). In essence, the back of the blade serves as a steady rest, eliminating the side-to-side wobble and allowing you to control the cut with precision. The technique certainly takes some practice (you may want to try it with a wider blade at first), but you'll be shocked at the results.

**Offer support where needed—**If you're cutting a large piece, the small table of the bandsaw may not provide enough support. Also, the workpiece or the offcut

## STRAIGHT CUTS IN CURVED WORK

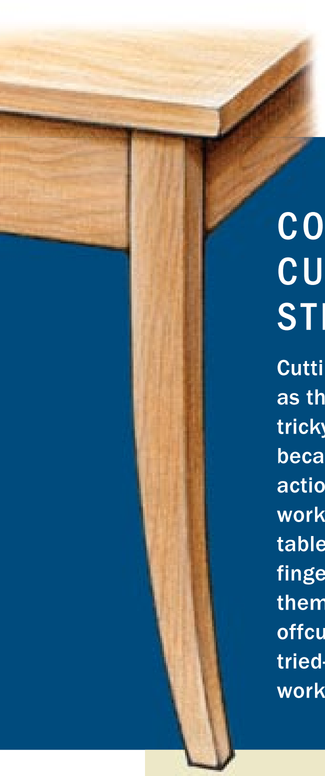


CONCAVE SHOW FACE



CONVEX SHOW FACE

***Bandsaw cuts are rougher on the bottom side.*** *So, when ripping a curved panel, such as a table apron or drawer front, be sure the show side is face up. If the concave side is the show face, cut it against a fence (left). If the show side is the convex face, support the cut with a block screwed to a fence (right). Locate screws where the blade won't hit them.*



## COMPOUND CURVES, STEP BY STEP

Cutting a curve, such as that on a leg, can be tricky and dangerous because the cutting action can slam the workpiece onto the table, drawing your fingers in or pinching them underneath. Taping offcuts to the blank is a tried-and-true method of working safely.



1



2



3

***Jigsaw puzzle.*** *To cut 3-D curves on a leg, use the waste from previous cuts to support stock for subsequent cuts. Transfer the shape to one side of the leg (1). Cut along the lines on both sides of the workpiece (2). Tape the offcuts to the workpiece (3) to support the blank, retrace the pattern, and make the final cuts (4).*



4

will tilt slightly and snag on the edge of the bandsaw table as it is swung around. To avoid this problem and make the cut safer, use either an outfeed support or a large auxiliary table that's clamped to the bandsaw table, or both.

When bandsawing thin stock, tearout is often a problem. To prevent tearout on the bottom of a thin workpiece, back up the cut using a thin sheet of hardboard taped to the bandsaw table. With this method you can make splinter-free cuts in stock as thin as 1⁄16 in. By the way, the rough blade still works in thin stock.

**Tricks for compound curves—**There are cases where it is not possible to have the wood always in contact with the bandsaw table. Cutting a compound curve can require that the part be lifted off the table at various points. This is not safe, because the cutting action can slam the wood onto the table, drawing your fingers in or pinching them underneath. One common method of supporting the workpiece is to tape the offcuts to the blank after each side is cut (see photos, left). This is a typical procedure for making cabriole legs, but it works for any leg that is shaped on multiple sides.

Another method is to use a block under the concave area of a workpiece, a technique especially useful when you're cutting a curved apron or drawer front. Be sure to orient the workpiece with the show face on top (see bottom photos, p. 37).

### Simple methods to remove sawmarks

Any cuts made on the bandsaw, no matter how skillfully done, will need to be cleaned up to remove the sawmarks. Curves can be smoothed using hand tools or sandpaper. Whatever your approach, the goal is to create a flawless surface that's easy on the eyes and fingers.

When working with solid wood, I always look first at using a compass plane or spokeshave to smooth or fair a curve.

I use custom sanding blocks made to match the curve. I often make these blocks from the offcuts or trace the pattern onto a separate blank. The closer the sanding block is to the shape you're after, the better you will be able to smooth the curve. If the workpiece is convex, the sanding block is concave; a concave workpiece gets a convex sanding block. Serpentine curves or curves made from variable radii may require several sanding blocks.



## FLAWLESS SMOOTHING

**Here are four great options for polishing off your carefully cut curves.**

### PLANE OR SHAVE

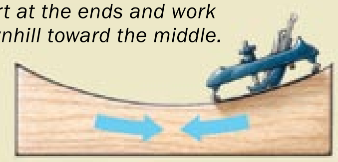


***Follow the grain when planing.*** *On a curved piece, the grain changes direction. So if you use a compass plane (left) or spokeshave (above) to refine the shape, pay attention to the grain to avoid tearout.*

**CONVEX CURVE**
*Work from the middle of the curve toward the ends.*



**CONCAVE CURVE**
*Start at the ends and work downhill toward the middle.*



I also fair curves using a belt sander fitted with a curved wooden block mounted to the sander's platen. I mount my sander to a custom table so that I have more control over the workpiece (see drawing, below) and I keep the platens for future jobs.

Remember, once a surface has been sanded, by hand or by machine, grit will invariably be left behind. Any hand-tool work or routing should be done first; otherwise, the embedded grit will destroy your cutting edges. □

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*To see more of Michael Fortune's work, go to www.michaelfortune.com.*

### SANDING BLOCKS



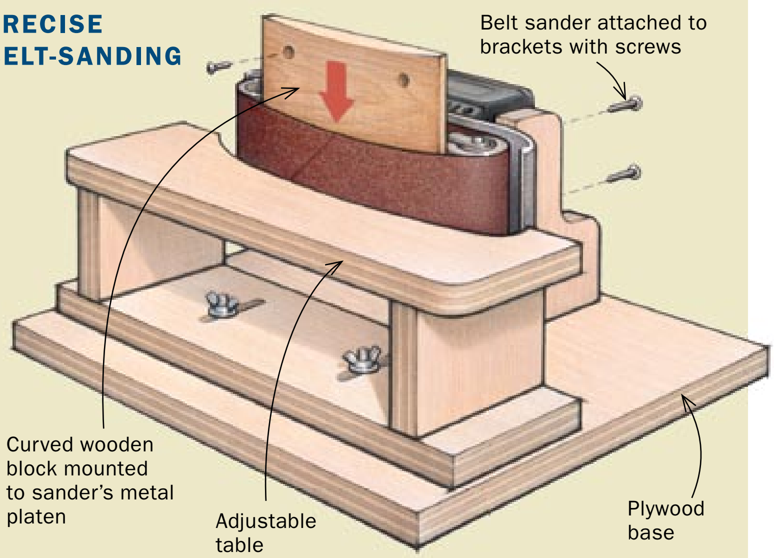
***Make curved sanding blocks that match the profile.*** *Staple sandpaper to the bottom of the block. For a concave block, it's better to use spray adhesive. If you have problems with the paper tearing, reinforce the back of the sheet with duct tape.*





***Soup up your sander.*** *Fortune mounts curved wooden blocks on the metal platen of his belt sander. He mounts the sander in a shopmade table to add even more precision.*

### PRECISE BELT-SANDING





# Build a Prairie Settle

## New take on a classic design—construction is as simple as ever

BY KEVIN RODEL

This settle is a perfect example of the low horizontal lines—reminiscent of the broad horizon of the Midwest—that characterize Prairie-style furniture. Even though the heyday of the Prairie School of architecture and furniture (largely credited to Frank Lloyd Wright) lasted only from about 1900 to 1915, the strong lines and characteristically unadorned style make it as popular today as it was back then.

The basic form is classic, but a few details make this settle uniquely mine. I added the scoop-out on the feet, the hip-roof shape on the arms and corbels, the pyramid-head pegs, and the slight extension of the back of the side arms beyond the long arm. But the most distinctive part of this settle is the square cutouts in the slats.

Although the overall size and the number of parts involved make this piece seem like a more advanced project, it's very straightforward. Most of the construction involves simple mortise-and-tenon joinery. The corbels are the most complex part, but I'll show you an easy way to make them quickly and consistently.

The dimensions of the piece are standard to the period and type of furniture but can easily be changed to accommodate different body types or room sizes. The height of the settle can be adjusted by changing the length of the leg posts and the placement of the horizontal pieces. The length is modified by changing the length of the long rails and the number of slats in the back and/or the spacing between them.

There are upholstery options to consider: attached, integral spring-form cushions, or loose cushions. I like the loose cushions



Photos: Anissa Kapsales; drawings: Bob La Pointe

because the upholstery method is easier for an amateur. If you use fabric covers, you'll need an upholsterer to sew the cushions. If you use leather, you can have an upholsterer sew them or lace them yourself, as I demonstrate on FineWoodworking.com.

While this settle is made of quartersawn fumed white oak and is upholstered with leather, don't feel limited by my choices. The form's strong lines and a wide choice of fabrics allow this piece to look great in almost any wood species and in a variety of settings.

## First things first: the leg posts

It is difficult to find quartersawn 12/4 oak, but if the posts have a face with ray fleck, I put it on the sides of the piece, so the nicest faces can be seen in pairs. After dimensioning the posts, lay out the mortise locations and corbel grooves as well as the stub tenon shoulder line.

If you don't have a dedicated mortising machine, you can cut consistent mortises using a simple router-box jig (for more on this jig, see "Arts and Crafts Side Chair," *FWW* #190). Cut all mortises as sets to keep router-setting changes to a minimum.

The grooves for the corbels can be cut either with a dado blade on the tablesaw or with a router and edge guide. The router method is slower, noisier, and messier, but the dado blade leaves a larger area to clean up by chisel at the end of the groove.

The stub tenon on the post top is square and centered on the post and is easily cut on the tablesaw.

This is also a good time to cut the mortises that will house the raised ebony plugs. The small scoop-outs on the post bottoms are optional, but I do it as a signature detail on almost all of my work. Finally, I break all the edges, sand off any layout lines, and finish-sand to P220-grit. Because none of the joints are flush, sand all the parts before assembly so you don't have to sand into corners later. The completed settle will get just a final touch-up sanding.

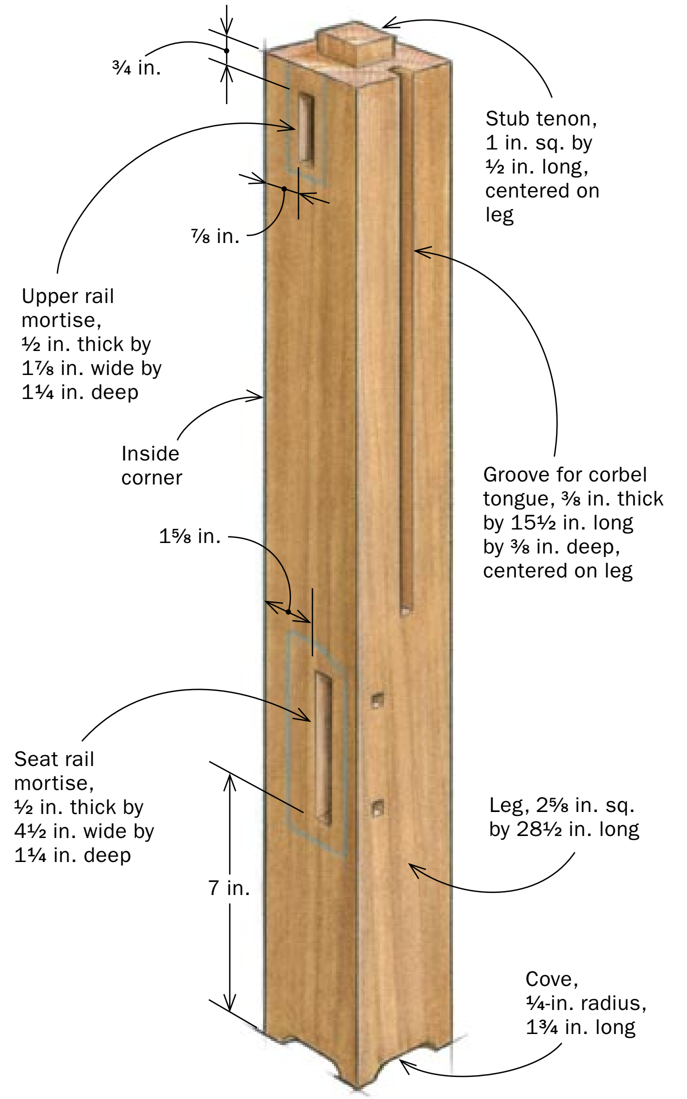
## Tackle the rails next

With the posts complete, proceed to the horizontal elements that are tenoned into the posts: three long and four short rails. The length is determined by taking the between-post dimension and adding the tenon lengths. If you wish to make your settle longer or shorter, now is the time to do it.

**How to cut tenons on long rails—**I cut tenons on the tablesaw, using a method that works well on the front and back rails, and any other pieces that are too long and heavy for a tablesaw tenoning jig. I cut shoulders and cheeks with the pieces flat on the saw table with the rip fence as a stop for the tenon length. The upper and lower rails are different thicknesses, so their tenons are cut with different blade heights. But it is critical that all the shoulder locations are the same, so the rip-fence setting will not change.

Start with the bottom rails. Because these tenons are offset, you'll have three blade settings: a shallow ¼-in. shoulder and cheek cut on the front face, a deeper one on the back face, and another setting for

## LEGS ARE THE FOUNDATION






***Stub tenons on the tablesaw.*** *The tenon at the top of each leg post is formed with a series of passes on the tablesaw, using the rip fence as a stop and rotating the post.*

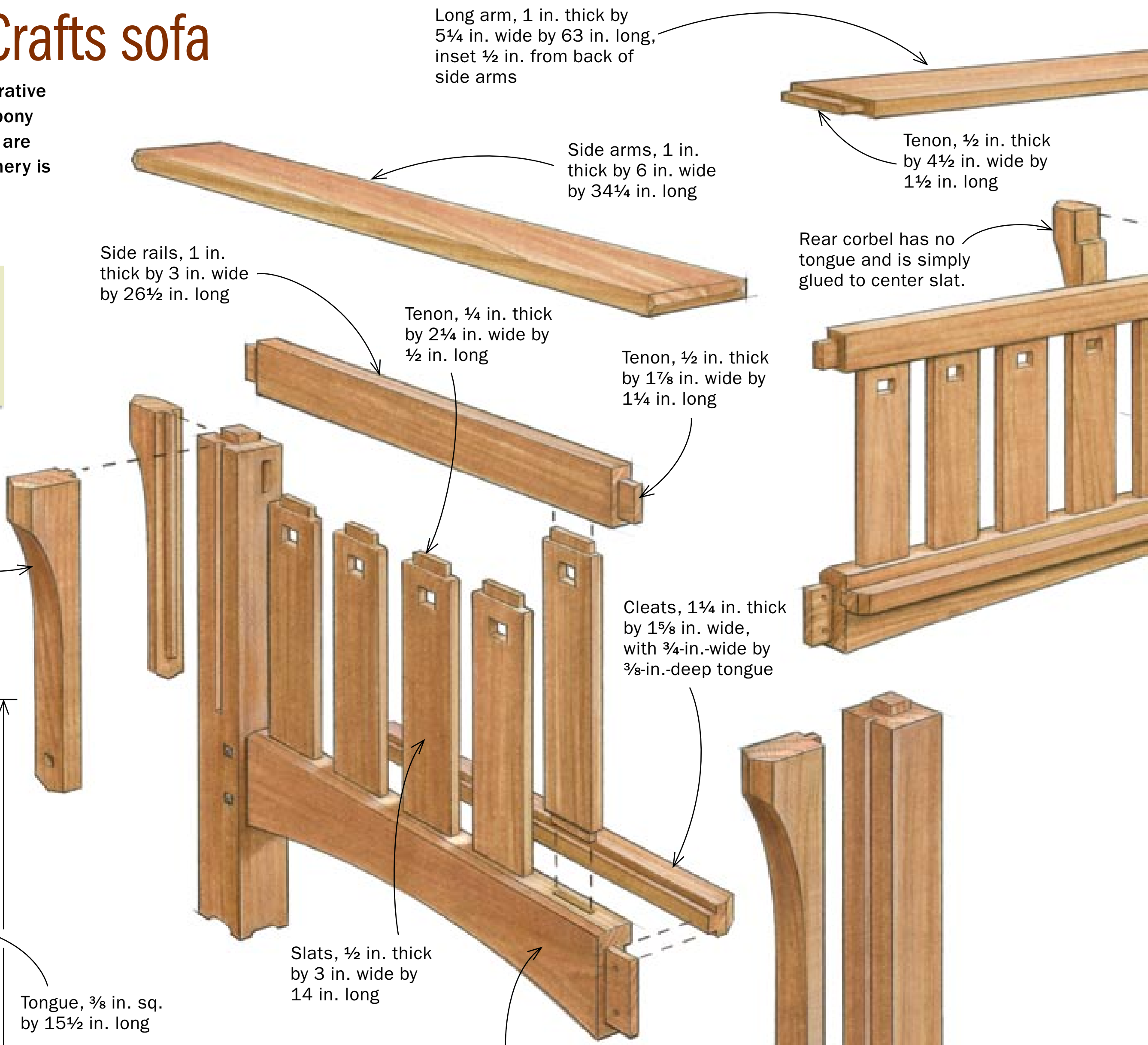


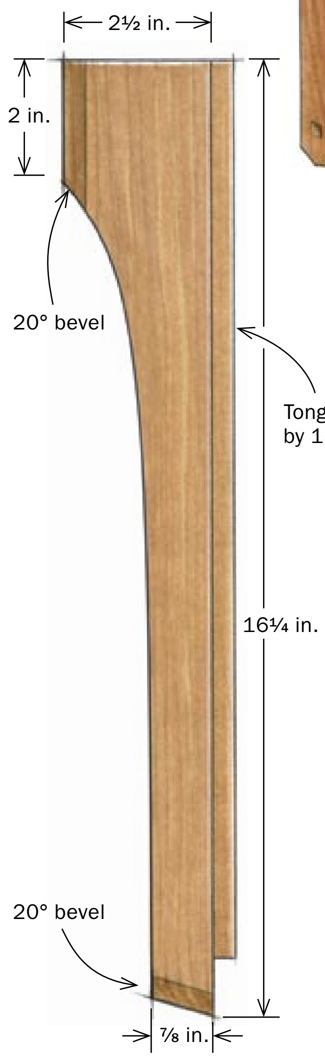
***Coves lighten the feet.*** *With the leg post in a vise, using a handheld laminate trimmer (with a ¼-in. bearing-guided cove bit), move in at one pencil mark and out at the other.*

# Arts and Crafts sofa

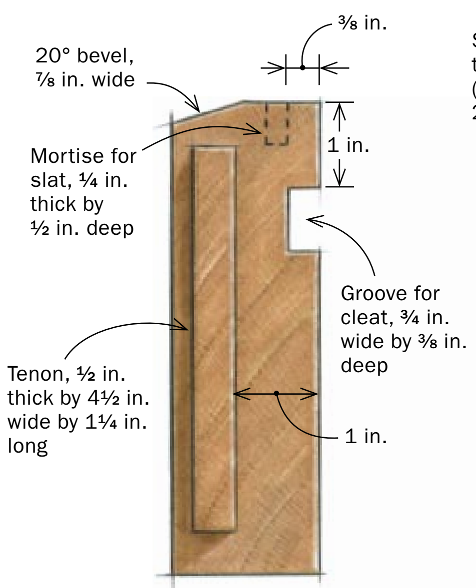
**While the details—decorative corbels, pierced slats, ebony plugs—are refined, they are easy to execute. The joinery is straightforward, too.**

Full-size plans for this Prairie settle and other projects are available at FineWoodworking .com/PlanStore.

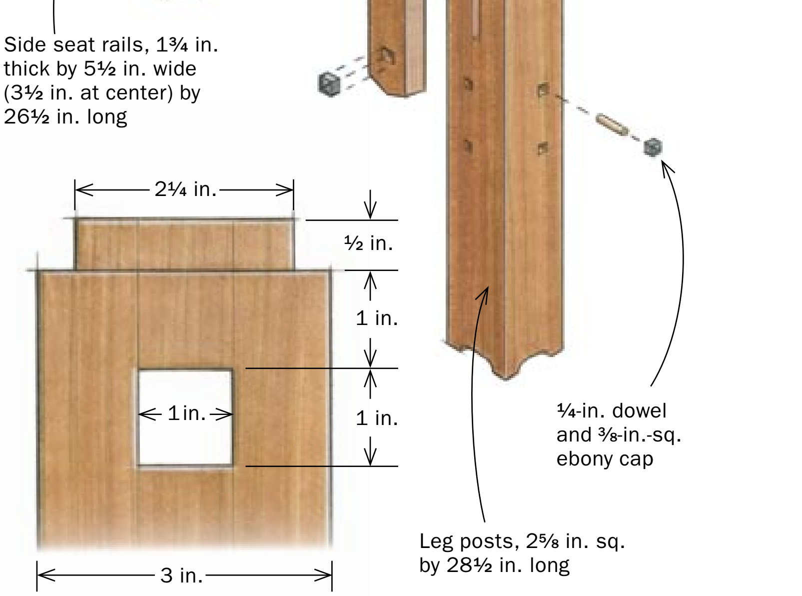


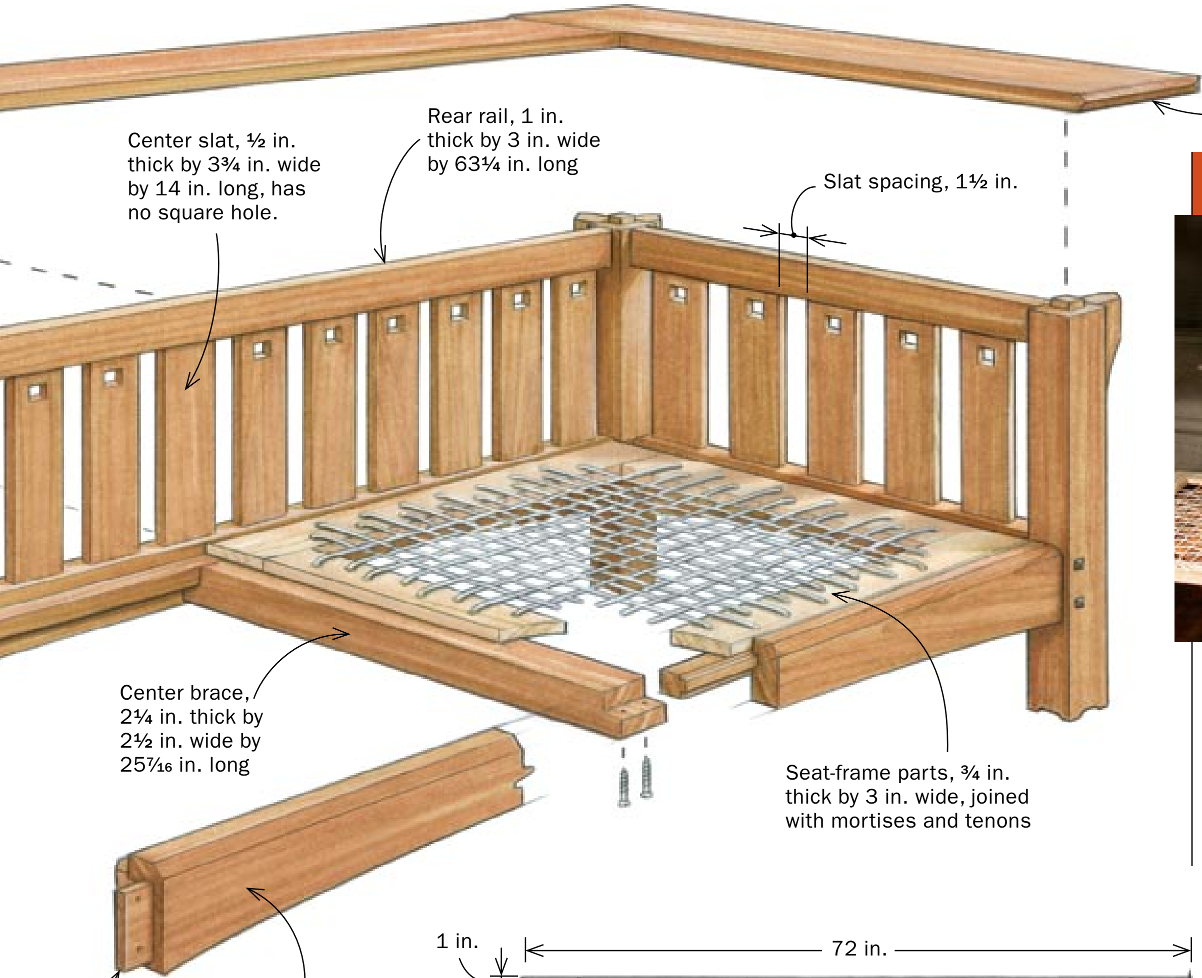

CORBEL DETAIL

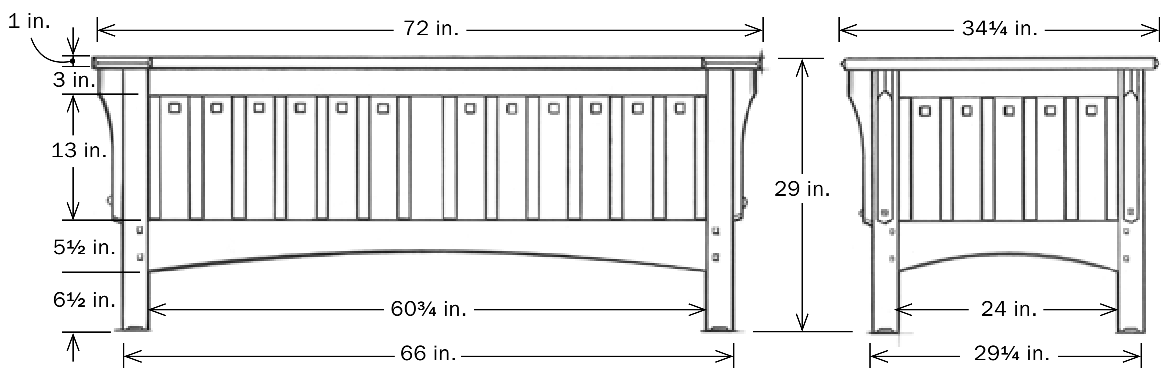



SEAT-RAIL DETAIL




SLAT DETAIL




## SEAT FRAMES



***Simple weave.*** *The seat frames are woven with ¼-in. nylon rope, first in one direction and then in and out in the other direction. To maintain strength in the frame, stagger the ⁵⁄₁₆-in. holes about 1½ in. apart, one row ¾ in. from the inner edge and the outer row 1½ in. from the inner edge.*

## CONSISTENT CORBELS





***A simple jig.*** *Once the corbel stock is rough-cut close to the line with the bandsaw, screw it directly into a shaping jig (left). The holes will be concealed when the corbels are in place. Then use a top-bearing-guided router bit (Amana #45468) to match the corbel to the template (center).*



***Tablesaw creates the tongue.*** *Make the side shoulder cuts, flip the corbel curve up, and rip perpendicular cuts to remove the rest of the material.*

## RAILS GET TENONS AND ARCHES










***Easy tenons on big pieces.*** *Keep the pieces lying flat on the tablesaw. Using the miter gauge for control and the rip fence as a stop, make all the shoulder cuts (1), adjusting the blade height as needed. Without moving the fence and making sure the blade height is set accurately, make a series of passes to waste away material (2). Last, slide the tenon horizontally across the blade to clean up the cheeks (3). The rip fence will keep you from going too far.*

the edge shoulder cuts. I cut the shoulders and cheeks in the same operation. After I make the first shoulder cut, I make a series of passes through the waste material of the cheek. Then I slide the rail back and forth over the blade to clean up the waste. Once the cheek is clean, I flip the board, adjust the blade height, and cut the other side.

If you have a good dado set that won't give a sloppy cut, you can use it here, but I don't bother. Now do the upper rails the same way, adjust the blade height, and move to the edge shoulder cuts.

**Mortise for the slats—**Now that the tenons have been cut on the horizontal pieces, cut the small mortises for the vertical slats. Clamp the corresponding sets of upper and lower rails together, inside face to inside face, making sure the upper edge of the bottom rail and the bottom edge of the upper rail are in the same plane, and mark the mortises on both pieces. The center slat is a little wider than the rest and doesn't have a hole, which makes the math easier. The corbel that will attach to the back of the center slat disguises the difference in width and covers where the hole would have been.

I cut the mortises with a router, using a fence riding along the inside face of each rail, and then I chisel the mortises square.

**Bevel the lower rails and run a groove for the seat cleat—**The upper rails are complete, but the lower rails need a few details. The lower rails get a bevel of about 20° to their upper outside edge. Using a dado set, cut a groove (to hold a cleat that supports the seat frames) around the inside face of the lower rails.

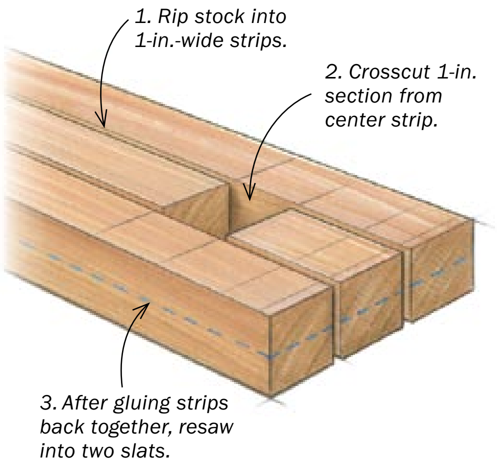
**Arches—**At this point you can cut the arches along the bottom edges of the four rails. I draw the arch on a ¼-in. Masonite template, bandsaw close to the line, and file and sand the rest of the way. Then I use the template to trace and rout the arches on the workpieces.





***Template ensures smooth arches.*** *After tracing the shape of the template (above), bandsaw close to the line, and then use a top-bearing template-guided router bit (Amana No. 45468) to shape the arches (right). The rails are thicker than the bit, so you'll have to make two passes, the first with the bearing riding the template and the second with it riding on the just-shaped part of the rail.*

## SLATS MADE SIMPLE








***Cut slat stock into five pieces.*** *First, make two 1-in. rip cuts through the stock (left). Then crosscut the center strip in two places, cutting out the area of the square hole (above). Make sure to mark the slats before cutting them so reassembly will be easy and the grain will match.*

### Move on to the vertical slats

Now it's time to make 23 vertical slats, 22 with square holes and one slightly wider (the center slat in the back) without a hole. To minimize waste, increase consistency, and save time, I make 11 slat blanks from 5/4 stock, rip the blanks into three strips, lightly joint all the sawn edges, cut the holes on the tablesaw, reassemble the pieces, and then resaw them into 22 slats. Mill the odd slat without a hole to the same thickness and length but about ½ in. wider.

Careful marking and organization are the keys to keeping this process quick and painless. First, lay the 11 blanks out on a bench and joint one edge (either all the right edges or all the left edges). With a square, draw a tentative end cut line across the top face of each blank. Move down ½ in. and draw the tenon shoulder line, move down 1 in. and draw the top of the square hole, and finally move down another 1 in. and draw the bottom of the hole.

Once you resaw the slats you should have 22 of them. Don't forget to mill the wider center slat to the same thickness as the rest. Now cut the tenons on the ends of the slats, using the same quick method you used on the rails.

### Putting it all together

Start with the two sides. Glue and clamp the slats into the side rails, and then add the leg posts. While these are drying, glue together the remaining slats and the long back rails.

When all these subassemblies have cured, glue the seat frame cleats into the grooves, then glue the back subassembly and front rail to the two sides.

With the basic framework complete, it is time to attend to a few more details: the center brace, corbels, arms, and ebony plugs.

**Center brace—**Because the center brace is never seen, it can be made from lower-grade stock. Notch the upper face of each end of the brace to fit around the seat-frame cleats that are glued to the rails. The top face of the center brace should be level with the top faces of the frame cleats. Screw and glue this brace from underneath at the settle's center point into the underside of the seat frame's cleats.

**Corbels—**The corbels are largely decorative but do give some support to the arms. I use a template made of ¼-in. Masonite to draw the shape of the corbels onto the stock. Then I rough-cut with the bandsaw along the curved sides and use the tablesaw to



***Reassemble the pieces.*** *Glue all the pieces back together, using the cutoff from the center strip as a spacer. Rotate the cutoff 90° to keep it away from the glue squeeze-out. When the glue is dry, mill the blanks lightly, to clean them up, and rip them to exact width.*



***Resaw the stock to double the count.*** *Before resawing, cut the 11 blanks to length. Mark a line 1½ in. from the top of the square hole. All the blanks must be cut the same, or the holes will not line up. With the top cut made, cut the blanks to length. Now resaw them to make 22 slats, mill them flat and smooth, and cut all their tenons.*

## ASSEMBLE THE FRAME





***Start with the sides.*** *The first assembly consists of the short horizontal rails and the vertical slats (above). Rodel uses the arch cutoff to aid in the glue-up and measures diagonals to be sure the assembly is square. While the sides are still in clamps, add the leg posts to complete them (right).*

crosscut the wide end square before attaching the corbels to a jig and trimming them flush to the template.

Using the tablesaw, cut the tongue along the straight side simply by cutting two rabbets along each side and leaving the tongue in the center. The center corbel for the back of the settle doesn't get a tongue because it is glued directly to the back slat rather than inserted in a groove. So cut off the extra tongue material at this point. Cut the tongues on the other six corbels. Cut off the lower section of the tongue to match the length of the groove. Finally, cut the corbels to their finished length with a 20° bevel cut. Bevel the upper 2½-in. facing edge to a centerline, 20°, either by handplane or tablesaw. Lay out and chisel a recess for an ebony plug at the lower end, sand, and attach. The odd corbel in the center back needs to be notched to fit over the upper back rail. Its bottom edge is beveled at 20° in the reverse direction of the other corbels to fit snugly over the beveled upper edge of the bottom rail. This tongueless corbel is glued directly to the hole-free center slat.

**Arms—**The arms (two short side pieces and a long back piece) are the *pièce de résistance* of this design, so use your best figured stock here. To cut the mortises in the side arms, use the same router method that was used to cut all the slat mortises in the rails. The 30° bevel on each end of the side arms is cut on the tablesaw. You want to end up with a hip-roof shape. The sawmarks on the end grain can be removed with a file and some light sanding.

With the side arms complete, cut the tenons on the back arm. Presand all edges before gluing.

It is usually best to cut mortises first and fit tenons to them. But attaching the arm assembly to the framework is an exception; the



***Move to the back and full frame.*** *Assemble and glue the long rails to the vertical slats. Once this assembly is dry, working with one side on the floor, add the back assembly and front rail to the side assembly (above). Turn the frame upright, add the second side, and clamp (right).*



## ADD CORBELS AND ARMS





***Glue the arm assembly together.*** *Use a spacer stick between the side arms at the open end to make sure the clamps do not pull the arms out of square (left). To cut the mortises, use a small handheld router to waste away material close to the line, and then clean up the mortise by hand (above).*

tenons had to be made first. Set the arm assembly on the frame to locate the mortises for the four leg-post tenons, then cut them.

**Ebony plugs—**For the decorative ebony pegs, I take some square stock, in this case ⅜ in. square and ½ in. square, and use a disk sander to shape a shallow pyramid head on one end. Lightly sand the sharp corners and edges and cut off by hand the length of peg needed. With some glue in the recess, tap the peg into place.

Now you can start finishing the settle while working on the seat frames and cushions. If you used white oak and plan to fume it, you can refer to my article "Fuming With Ammonia," *FWW* #126. After fuming, I use Tried & True Danish Oil for the first coat, followed by two to three coats of Tried & True varnish oil.

### Get ready for the upholstery

The first step is the woven-cord seat frame. I use ash for the frame stock, but any strong hardwood will do. The two frames (with mortise-and-tenon joinery) sit on the cleats and meet in the center, overlaying the center brace. Dry-fit the frame, then lay out the hole pattern. I use ¼-in.-dia. cord (available at hardware stores), so I use a drill press to drill all the 5⁄16-in. holes. A countersink gives the holes a slight bevel to prevent wear on the cord. You'll use about 60 ft. of cord per frame.

With the holes drilled, the frame glued up, and the edges broken, clamp the frame into a bench vise and weave. It will be slow going at first, but it will speed up as you use more cord. Lace all of the horizontal rows, pulling tight as you complete each row. Then, on the verticals, weave the cord back and forth through the horizontal rows and again pull tight as you go. Tie off the ends with a simple overhand knot, keeping the knots on the underside. The finished web should be fairly stiff. You can screw these frames to the cleats or leave them loose. At this point, you can make the cushions or pick them up from the upholsterer. □

*Kevin Rodel makes furniture in Brunswick, Maine.*



***Glue on the corbels and arms.*** *Before attaching the arm assembly, glue the six corbels to the leg posts and one to the wide center slat in the back. When dry, attach the arm assembly to the frame (left). The large amount of glue surface makes this a strong joint all around. Make sure to use enough clamps on the long back to apply consistent pressure.*



**CUSHION SIZES**

The cushions are medium-density foam with a cotton batten material glued to it. The upholstery is a high-quality supple leather.

Bottom cushion foam:
30½ in. by 26 in. by 5 in.

Back cushion foam:
30½ in. by 11½ in. by 4 in.

Side cushion foam:
20 in. by 11½ in. by 3 in.

**Online Extra**

To see Rodel making the leather cushions for this piece, go to **FineWoodworking.com/extras.**

# Small Clamps Everybody Needs










We put dozens to the test, but only 7 emerged as must-haves for woodworkers

BY TOM BEGNAL



Photos, except where noted: Kelly J. Dunton

A good collection of small clamps is invaluable in the workshop. As my 48-in.-long clamps collect dust, an array of small clamps make a seemingly endless number of visits to my bench.

The ideal small clamp, I suppose, would work perfectly in every imaginable application. That means it would open and close quickly, tighten just as easily, and provide adequate pressure. The jaws wouldn't dent or stain the workpieces. Clamping pressure wouldn't cause the workpieces to shift. It would clamp non-parallel surfaces. And it would release pressure easily.

I've yet to find that mythical clamp. Like most of you, I've used several different types to cover the common woodworking tasks. But there were many I hadn't tried. With that in mind, I recently took a close look at the growing array of small clamps on the market.

All told, I gathered about 40 models in the *Fine Woodworking* shop. Then I set about using each one in a variety of common woodworking applications. I tested several sizes and models in each clamp category. Once the glue had set and the dust had settled, I ended up with seven essential clamps.

By the way, a small clamp—at least according to my definition—has a maximum jaw opening of 6 in. Because I focused on the most common woodworking applications, this article doesn't cover lesser-used, specialty clamps such as toggle clamps, miter-joint clamps, deep-throat clamps, and the like.

*Tom Begnal is an associate editor.*

## Spring clamps great in a pinch



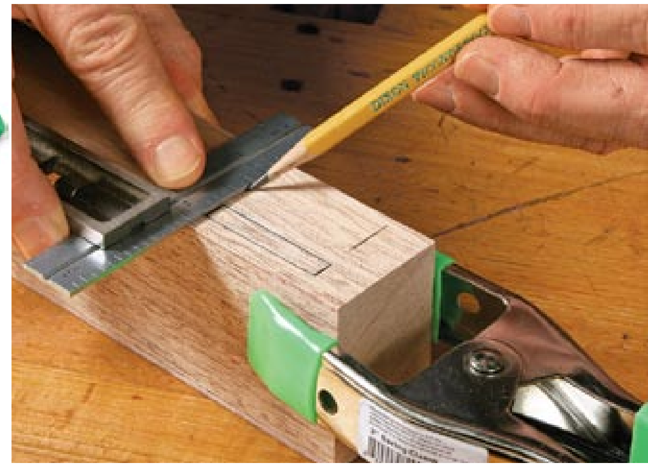
**Uses:** Holding small parts; light-duty and temporary clamping

**Clamping force:** 48 lb.

**Author's favorite:** 2-in. spring clamp, $1

**Source:** The Home Depot

**Others tested:** Bessey spring clamp, Bessey VarioClippix, Pony hand clamp, molded grip (Woodworker's Supply), Irwin Handi-Clamp, Ratchet-Lock (GarrettWade)



***Temporary hold.*** *With a spring clamp marrying a pair of door stiles, it's simple to transfer the mortise location from one part to the other.*

**You can't beat a spring clamp for ease of use. As the name suggests, a coiled spring creates the clamping force.**

**But spring clamps don't generate much pressure, so they aren't a good choice when gluing large parts. When gluing little parts, however, they often are your best choice. You can get a decent, midsize spring clamp for under a buck at home centers.**

**Because they are used one-handed, you can easily put one or two spring clamps to work holding a stop block in position. Or, when laying out joinery, you can butt the parts together face-to-face, hold them in position with one hand, and put a spring clamp on each end to keep the parts aligned as you transfer the lines from one to the other.**

**Traditionally, spring clamps were made from steel, but some are now plastic except for the spring. I looked at generic steel versions sold by The Home Depot and plastic versions by Quick-Grip. Both worked fine, but the generic brand fit my hand better, making them somewhat easier to squeeze.**

**Recently, a new type of spring clamp has come on the market. For lack of a better description, I call it a hybrid. It locks with ratcheting action. All the hybrids worked OK, but none worked as well as the classic steel spring clamp. Plus, the hybrids cost more.**



***Simple and fast.*** *When attaching small parts like these glue blocks, spring clamps make the task quick and easy.*



***One-handedness is handy.*** *It takes just one hand to use a spring clamp, leaving your other hand free to position something, like this stop block on a tablesaw miter fence, before adding a stronger clamp to lock the block in place.*



## Bar clamps are the workhorse

**Uses:** Tasks that require lots of clamp pressure

**Clamping force:** 760 lb.

**Author's favorite:** 6-in. Bessey Tradesman, medium-duty, $10

**Source:** www.woodcraft.com

**Others tested:** Irwin, Jorgensen, Lee Valley, Rockler, Shop Fox, Steelex Plus (Grizzly), Woodtek

**Small bar clamps get their name from the sturdy steel bar that runs the length of the clamp. They have two jaws: a fixed one at the end of the bar, and a sliding one that includes a threaded rod (typically an Acme thread) with a handle on one end.**

**Among all the various types of small clamps, the bar clamp has several advantages. It adjusts quickly and easily. Plus, it provides plenty of clamping force, around 760 lb. in our test.**

**For those reasons, I reach for a short bar clamp more than any other small clamp. It is ideal for applying side pressure to open mortise-and-tenon joints (also called slip joints or bridle joints). For bigger edge-gluing jobs, like making a tabletop, I'll use short bar clamps to squeeze the ends of clamping cauls and the ends of boards at the glueline. When gluing bent laminations, woodworkers take advantage of the bar clamp's wide capacity, quick adjustment, and substantial clamping force. And I could easily list a few dozen more places where a short bar clamp gets good use.**

**Clamp manufacturers typically offer bar clamps in three strengths: light duty, medium (sometimes called standard) duty, and heavy duty.**

**My favorite bar clamp is the Bessey medium-duty Tradesman. It was easy to handle, produced lots of pressure, and didn't discolor the wood. I liked the heavy-duty Jorgensen, but when the clamp remained overnight on a workpiece, the plastic clamp pads sometimes left the wood slightly discolored. It took some light sanding to remove the oily smudge.**



***Great for glue-ups.*** *A good bar clamp can produce a lot of clamping force and is easy to use, making it a good choice for applying side pressure to a half-lap joint.*



***Alignment control.*** *When edge-gluing, keep the surfaces of boards from slipping out of alignment by placing short bar clamps on the ends of clamping cauls and also at each joint at the ends of the boards.*



***Wood bender.*** *Michael Fortune finds that bar clamps are a good choice for bent laminations—the clamps are quick to adjust. But you'll need more than a few.*

Bottom photo: Mark Schofield




## 'Quick Grips' do just that

**Uses:** One-hand clamping when spring clamp is too small; dent-free clamping of stock to workbench; spreading parts

**Clamping force:** 225 lb.

**Author's favorite:** Irwin 6-in. Quick-Grip, $18

**Source:** www.rockler.com

**Others tested:** Bessey DuoKlamp, Midi Bar-Man, Shop Fox

**Of all my small clamps, I use these least of all. I find them bulky and a bit awkward to use, especially for glue-ups, where they tend to shift the parts.**

**But I do find them useful for some tasks. When one hand is already occupied positioning a workpiece and a spring clamp can't open wide enough, I'll use a one-hander to temporarily clamp the parts together until I can get a bar clamp in play. I also use them as hold-downs and spreaders.**

**All the one-handers I looked at would work just fine for my needs. Forced to pick one, I'd favor the Irwin Quick-Grip. It has a big handle and trigger, and oversize clamp pads.**



## New cam clamp is quick, strong, and light

**Uses:** Small repairs, clamping small parts, light-duty tasks

**Clamping force:** 240 lb.

**Author's favorite:** 4-in. Bessey KliKlamp, $19

**Source:** Hartville Tool (www.hartvilletool.com)

**Others tested:** Klemmsia (wood), Shop Fox (wood)

**A cam clamp is especially quick to adjust, tighten, and release. And it's light in your hands. Then, too, thanks to its clamping action, workpieces are less likely to slide or twist as pressure is applied. So, a cam clamp is perfect for those tasks where you don't need a mountain of clamp force, such as gluing small parts, doing repairs, and holding a template in place for routing or layout.**

**The classic cam clamp has wood jaws, but my favorite turned out to be a metal one by Bessey called the KliKlamp. Considering how nicely this small clamp works, I'm putting it on my list of keepers. Be aware that you won't always have the room you need to swing the lever.**



***Spreading option.*** *Some squeeze clamps convert into spreaders, an advantage when you want to spring apart the legs of a stool so a loose rung can be reglued.*



***One-hand holder.*** *Using these clamps, you can quickly clamp a workpiece to the bench and rout halfway around it. The thick, soft pads won't mar your work. The clamps can be removed quickly and reclamped to reposition the workpiece.*



***Easy repair.*** *A small repair generally requires only moderate clamping force, so it's a perfect spot for a convenient cam clamp.*



***Fast and light.*** *The KliKlamp is lightweight, easy to adjust, and simple to tighten, so it's convenient for temporarily holding a template in place as you scribe a cut line.*

## Light parallel clamps stay square




**Uses:** Applications where you don't want parts to slide out of position

**Clamping force:** 325 lb.

**Author's favorite:** 6-in. UniKlamp, $22

**Source:** www.highlandwoodworking.com

**Others tested:** N/A (none similar)



***Light assembly.*** *Begnal uses four UniKlamps to glue the sides of a box with rabbeted ends. The clamps keep the sides square and apply force to the full length of the glue joints.*



***Slip-free hold.*** *To attach a fence to the base of a jig, Begnal uses a UniKlamp to hold the pieces square, without shifting them, until screws can be added.*

Parallel clamps, which have been around for about 15 years, were first introduced by Bessey and called the K-Body Clamp. The Bessey K-Body was an immediate hit because the jaws remained parallel no matter how much clamp pressure was applied. That meant workpieces were much less likely to slide out of position before the glue dried.

The shortest available K-Body clamp is 12 in., too long to be considered a small clamp. However, a few years ago, Bessey began making a light-duty parallel clamp called the UniKlamp in a 6-in. length.

The UniKlamp generated a respectable force of about 325 lb. in my test, yet it's relatively light and the sliding jaw moves without much fuss. It's great when you need moderate pressure and the workpiece would likely slip or twist if squeezed by any other clamp. I've use UniKlamps when clamping a fence to the base of a jig, relying on them to keep the fence in perfect position until screws are driven. When gluing a box with rabbeted ends, the parallel jaws allow you to apply even pressure all along the glue joints.



## C-clamps pack the biggest punch

**Uses:** When maximum pressure is needed

**Clamping force:** 1,100 lb.

**Author's favorite:** 6-in. Adjustable brand, $8

**Source:** www.coastaltool.com

**Others tested:** Claw Clamp (Shop Fox), Pony Deep Reach





***Clamping-force king.*** *When you need a lot of clamping force, like when face-gluing stock to make a single leg (above), there's no better small clamp than a good C-clamp. A pair of small C-clamps is perfect for clamping a wooden edge guide to a router base (left).*

Compared size-for-size to other small clamps, the C-clamp is unmatched when it comes to clamping pressure. For those occasions when you need all the clamping muscle you can get, the C-clamp is hard to beat. Small C-clamps are handy in tight spots, such as clamping a fence to a router base.

The main drawback to a C-clamp is that it's slow to adjust. Also, C-clamps don't come with clamp pads. You'll need to add them to avoid denting the workpieces.

A medium-duty Adjustable brand is a good choice. I found it produced about 1,100 lb. of clamp pressure. If that's not enough, a heavy-duty Adjustable brand will get you even more.



## Hand screws still unrivaled

**Uses:** Deep reach applications, angled parts

**Clamping force:** 1,000 lb.

**Author's favorite:** No. 1 Jorgensen, $23

**Source:** www.woodworker.com

**Others tested:** Rockler, Woodcraft

The woodworking hand screw has been around for hundreds of years. Hand screws have long jaws, so they offer a deeper reach than other small clamps. Also, the jaws can be angled, so it's easier to clamp odd-shaped parts or apply targeted pressure just at the tips. Last, the jaws are square, allowing a wide array of clever uses (see "Using Hand Screws," *FWW* #194).

The jaws crank out some pretty serious clamping force—about 1,000 lb. in my test. And they open and close pretty quickly; just grab a handle in each hand and start pedaling. I find that the No. 1 Jorgensen hand screw is a good size. Its jaws open to a full 6 in. Rockler's clamps worked almost as well, and sell for just $13.



***Surprising uses.*** *Clamped to the baseline of a dovetail layout, the jaw of a hand screw ensures that the chisel stays square to the face of the workpiece as you cut.*



***Long reach.*** *The hand screw has a relatively long reach. Here, Chris Becksvoort uses it to press home and clamp a knob to a wide drawer front. Note the leather pad that protects the knob from denting.*

## Small-clamp starter set

For new woodworkers, I've put together a list of my favorite small clamps, along with suggested quantities for each. Later, as you spend more time in the shop, buy a few more of the clamps you find yourself using most often.





***Get sharp quickly.*** *Putting an edge on plane irons and chisels can be less time-consuming if you set aside the honing guide and hone freehand.*

# Cut Your Honing Time in Half

## Freehand technique is much faster than jigs and guides

BY HENDRIK VARJU

If it weren't for commercial honing guides, many a modern woodworker would have a tool chest full of dull chisels and plane irons. Those little clamp-and-roller devices make it easy to hone a blade by holding it at a consistent angle while it's pushed across a flat sharpening stone. The trouble is, honing guides add time to the sharpening process. And even though sharpening is time well spent, it's also time not spent woodworking. That's why I hone my chisels and plane irons freehand.

By setting aside the "training wheels" of a honing guide, I can work my way quickly through a half-dozen chisels and three or four plane irons in a single session. Working freehand allows me to move from the bevel side to the flat side of each tool—or to switch tools entirely—without setting up or removing a guide. In the same fashion, I can move from one grit to the next without slowing down.

The key to successful honing is maintaining a consistent angle so you can be sure each successive stone is reaching the very tip of the tool. A few basic techniques will help you maintain that angle without the help of a jig, cutting your sharpening time in half.

### Choose a thick iron or a wide chisel for your first effort

At any given bevel angle, a thicker blade will have a longer bevel than a thinner one. This makes a thick blade much easier to balance during freehand honing. I suggest practicing at first with larger chisels, say 1 in. wide, and thicker plane irons. Once you perfect the techniques, move on to smaller chisels (say, ¼ in.) and thinner plane irons.

If you're sharpening a new chisel or plane iron, your first step should be to lap the back of the tool flat using medium- and fine-grit waterstones. Chisel blades should be dead flat on the back for at least the last inch or so before the tip; plane

### Secret of success: hollow grinding



***A curved stone cuts a curved surface.*** *A grinding wheel creates a concave bevel at the tool's tip.*



In my experience, a hollow grind on a blade's bevel is critical for honing freehand. A flat bevel rocks too easily, forming a convex shape that is nearly impossible to hold consistently against the stone. In contrast, a concave bevel has two contact points, so it is easy to maintain the correct angle (see facing page).

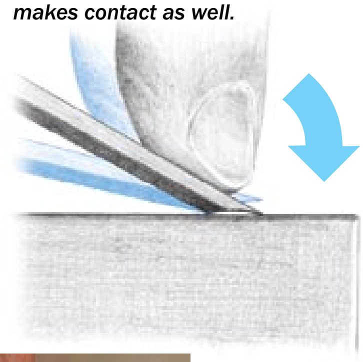
When honing freehand, the grinding and honing are done at the same angle. I prefer a 30° angle for most of my plane blades and chisels. I use a slow-speed, wet-wheel grinder and a tool rest that adjusts easily to the proper angle. The smaller the wheel, the deeper the hollow. I like the 6-in. wheel on my grinder. If you use a dry grinder, work with a light touch and pause often to cool the tip. (If the steel overheats and discolors, it won't hold an edge.) Continue to grind until the fresh surface reaches the whole bevel.



Photos: Steve Scott; drawings: John Tetreault

# Hone the bevel





***The hollow creates a stable platform.*** *Start by resting the bevel's heel on the stone (left), then rock forward (lower photo) until the tip makes contact as well.*

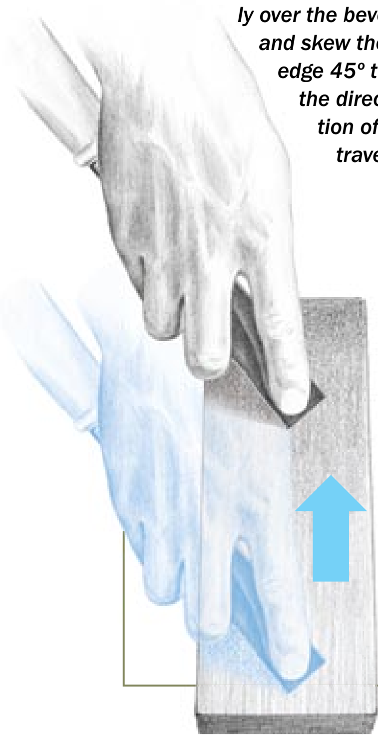


irons should be flat and smooth near the cutting edge.

After hollow-grinding the bevel on a chisel or plane iron (a crucial step, see facing page), it's time to hone. I use aggressive Norton waterstones, but oilstones or sandpaper on glass or granite also works. I start with a 1,000-grit stone, followed by 4,000 and 8,000 grits. Make sure the stones are flat before you start. I flatten stones by rubbing them against a 220-grit waterstone that I flatten on glass with silicon carbide powder.

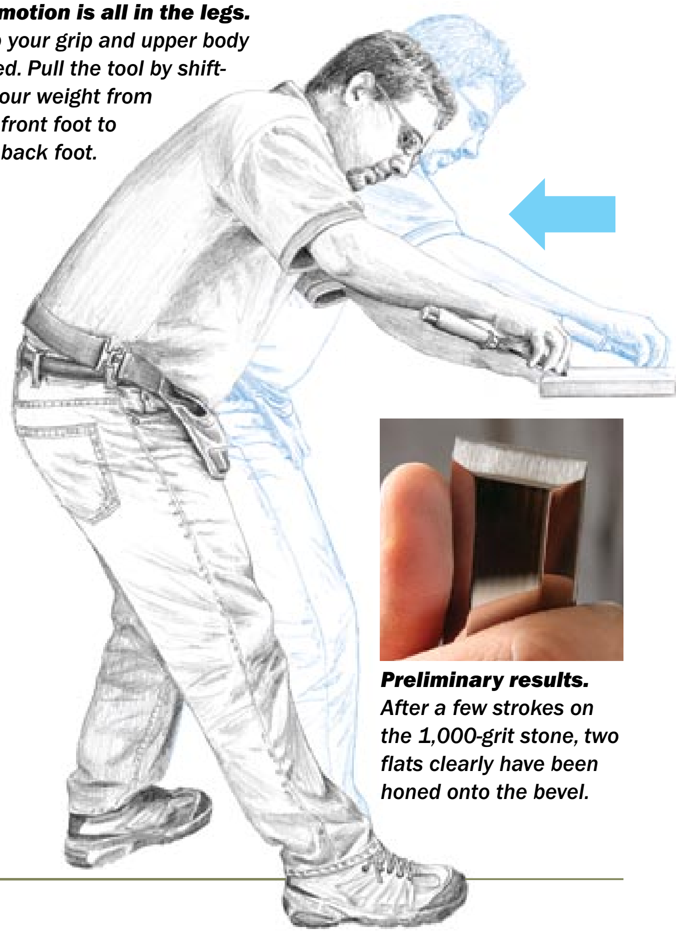
**Hone on the pull stroke—**Place the bevel on the far side of the sharpening surface, heel down. Rock the bevel forward until you feel the tip touch as well. The hollow grind creates a concave surface that has two contact points on the stone: tip and heel. So it is easy to feel when the blade is sitting properly.

For best support, hold the blade with one or more fingers directly above the bevel area on the flat side. Also, hold the blade at an angle to the stone's long dimension—as much as 45°. This increases the contact area's footprint in the direction of travel, making it far easier to balance as you pull the





***Hone on the pull stroke.*** *Maintaining the angle is easier this way, and prevents digging the edge into the stone. Keep one finger pressed directly over the bevel, and skew the edge 45° to the direction of travel.*

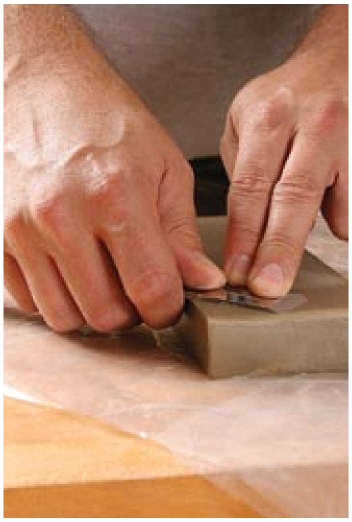


***The motion is all in the legs.*** *Keep your grip and upper body locked. Pull the tool by shifting your weight from your front foot to your back foot.*

***Preliminary results.*** *After a few strokes on the 1,000-grit stone, two flats clearly have been honed onto the bevel.*

# Remove the burr





***Hone the back on the push stroke.*** *Again the tool is skewed to the direction of the stroke. This helps prevent the trailing edge of the tool from lifting off the stone.*



***Come to a complete stop.*** *Don't lift the tool from the stone until you're done pushing forward. Otherwise you risk creating a microbevel that will complicate further honing.*

tool. When pulling the blade toward you, concentrate on locking your wrist, elbow, and shoulder in one position. Changing any of these angles during the stroke is likely to pull one contact point of the tool (usually the heel) off the surface. Instead, pull the tool toward you by leaning back with your upper body and shifting your weight in the process from your front foot to your rear foot.

Also, be sure to come to a complete stop on the stone before lifting the tool off the surface. Lifting the tool while still moving is a sure way to create a convex tip.

Use all of the stone to keep it from wearing unevenly. Take one stroke on the far left side, one in the middle, one on the right, and so forth. After a few strokes (usually only three to five with my waterstones), take a close look at the bevel. You may see a few remaining burrs on the tip if you removed much metal while grinding; don't worry about these. The key is that you should see a narrow band of flattened, polished metal at both the heel and tip of the bevel. The breadth of these bands is less important than making sure that the honed area reaches the edge. If in doubt, take a few more strokes. Avoid removing more metal than necessary, though; the goal is an edge that can be honed several times before you need to hollow-grind the tool again.

**Don't forget the back—**Before moving to the next grit, hone the flat back of the tool. This time, start at the near side of the stone and push the tool away from you.

On the push stroke, any burrs created by grinding and honing the bevel side are forced under the tool, cutting them off with



***A wide iron requires a different grip.*** *Apply pressure at the edge with your index and middle fingers. Use the same stroke as with the chisel.*

## Subtle changes when honing a plane iron



***Honing a cambered iron.*** *A plane iron with a slightly convex cutting edge won't leave corner tracks in a wide panel. Use both fingers to concentrate pressure on each corner in turn for several strokes. Don't lift the opposite corner.*



***The results.*** *After honing on a 1,000-grit stone, a cambered iron shows an undulating pattern that comes from increased pressure at the corners.*

# Is it sharp?



**Two easy tests.** A keenly honed chisel will cleanly slice the hair from your forearm (right) or take a thin layer of end grain from a piece of pine (below).





**Ribbons of cherry are the prize for a sharp iron.** Hollow-ground and honed freehand, the blade in this No. 4 bench plane yields thin, wide, continuous shavings.

just a few passes. In contrast, pulling the tool toward you folds these burrs back onto the bevel side, and you'll need more strokes to remove them. There's no need to lock your upper body as you did when honing the bevel; it is relatively easy to keep the blade's back flat on the stone, especially if you hold the blade on an angle to the path of travel. Holding the blade perpendicular to the long dimension of the stone can result in rocking, which leads to a convex back.

Also, avoid lifting the flat side of the blade off the stone while it's still moving. Doing so puts a microbevel on the blade's tip. This won't stop the blade from cutting, but it will effectively halt the process of honing the back. In future honings, you'll assume the tip is touching the stone on the back when it is, in fact, above the stone's surface.

To prevent this error, first come to a complete stop at the end of each stroke. Then lever the blade off of the surface by pushing down on the portion of the tool that's hanging off the edge of the stone. When I'm honing the flat side of a chisel, you'll hear the handle tap on the table next to the stone as I do this.

After a few strokes, feel the back with your finger, rubbing toward the tip to check whether the burr from honing the bevel side is gone. Once there are no remaining burrs on the back, you're ready to move to the next grit.

I then repeat this short process on my 4,000-grit stone, honing both bevel and back to reach an acceptable level of sharpness for most work. Repeating on 8,000-grit will bring the cutting edge to razor sharpness that will shave hair off your arm. Save this for plane irons and for working end grain with any tool.



**A fresh edge is tops.** The iron on top is freshly hollow-ground and honed, ready for use. The iron underneath has been honed repeatedly until the hollow grind has all but disappeared. It is ready to be reground.

## Back to the grind

When your tool's edge gets dull, you'll begin to see small nicks or a tip that reflects light at its very edge (meaning it is slightly rounded). To get a fresh edge, repeat the above steps without the hollow grinding. At some point, though, you'll need to return to the grinder. This is because each time you hone a tool, you expand the polished, flattened surfaces at both the tip and the heel, filling in the hollow between them and leaving too much metal for your finest stones to handle.

Narrow chisels and thinner plane irons will need hollow grinding more often as the shiny areas at tip and heel will meet after fewer honings, but some of my larger blades can be honed many times in between grinding sessions. As long as some of the original hollow grind is left, I keep honing without regrinding. But once the two shiny areas meet, it's time to go back to the grinder and establish a new hollow. □

*Hendrik Varju is a fine furniture designer/craftsman who operates Passion for Wood near Acton, Ont., Canada.*

# Light Up Your Cabinets

## How to add a warm glow to fine casework



BY STEVE CASEY

No detail adds more visual impact to your cabinets and built-ins than lights. Lights bring drama and functionality to new designs; they also enhance existing pieces with minimal effort.

It wasn't always this way. Thirty years ago, when I started, there were few, if any, lighting products designed specifically for furniture and cabinets. The options then consisted of weak incandescents, big, fat fluorescents, or expensive halogen architectural units. Today's systems are more plentiful, more varied, less expensive, and easier to use.

I put lights in almost all of my large-scale furniture and cabinet jobs. There are several applications; the most common one for furniture makers is to illuminate objects inside a cabinet. Lights over counters and desktops can brighten spaces that architectural lighting cannot reach, making those spaces more attractive and easier to work in. Finally, when I'm after pure drama, I sometimes use back- or top-lighting. Nothing highlights a piece of furniture like backlighting it to pop it off the wall.

### Design with lighting in mind

It's important to make lighting decisions early in the design phase. Choose the kind of lighting effect you want to create and select the specific bulbs and fixtures to achieve it. You have to do this early because some construction decisions will be driven by these choices. For instance, you'll need to hide the source fixture and the wiring while still providing access to them. You also may be dealing with some intense heat from the fixture itself and the light that it produces.

You can and should model the lighting to see if it will achieve the effects you want. It's a good idea to do this in low light conditions or even in the dark so you can see



Photos, except where noted: Steve Scott; this page: courtesy of Charles Shackleton

the true effects. Enlist a helper to hold up the lights and move them around while you look from a distance. You also can temporarily mount the lights in the case using double-sided tape, hot glue, or even screws (provided the holes won't matter when you're done); then add, subtract, or move the fixtures to suit your needs. When you are happy with the results, mark the placement so you can permanently install the lights when you are ready.

If you are lighting through several glass shelves, have the shelving in place and see if the light intensity is what you want on the lowest section. If you are using the most intense light available, like 20-watt halogen or xenon, and it seems weak, you can always double up the fixtures to double the light output. Model the placement again for the best dispersion in the space you are working with.

One case-construction detail to consider is leaving some room for the wire on the back of the piece. On both built-in work and freestanding pieces, I want the back recessed at least ½ in. to ¾ in. from the sides. This allows me to push the cases tight against the wall while leaving a place to let the wire hang freely so I can replace a fixture if it fails in the future.

**Lights inside a cabinet—**The only case pieces I wouldn't light from within are bookshelves. Ultraviolet light especially can harm books and artwork, and all light fixtures produce some level of ultraviolet light from minimal (fluorescent) to extreme (halogen). Make sure that the fixtures you are using have UV-filtering lenses to minimize exposure and damage from this type of light. Lighting books with ceiling-mounted fixtures is usually more efficient.

In display cabinets, the lighting usually is placed high and out of view. Locate the top of the crown molding or create a frame reveal in contemporary styled work a few inches above the display-case top. This creates a hidden space in which to conceal the wires and the tops of the fixtures. You can leave all of the wire exposed for ease of service and good ventilation, or you can hide it with a removable

## Inside and out

**Lights in cabinets like these by Charles Shackleton (facing page) and Michael Fortune (left) can offer general illumination or highlight individual spaces. Casey also mounts fixtures below a cabinet to light a work surface or behind a piece to add drama.**


INSIDE


BELOW


BEHIND

Photo, top right: courtesy of Michael Fortune

# Buyer's guide

**The market offers a wide variety of bulbs and fixtures. Start by deciding on the brightness and color of the bulbs, based on whether you'll be lighting display space or work space. Think about where you want to install the lights, and whether you want to use a line-voltage or low-voltage system, as this will affect your planning for heat dissipation, wires, and, if needed, transformers.**



### FLUORESCENT

These bulbs generate very little heat and cast an even light that is ideal for work surfaces such as desks or kitchen counters. They also serve well as accent or mood lighting. Choose warm white bulbs instead of cool white to render colors more naturally. The fixtures are slim enough to hide easily behind a cabinet face frame, and they come in varying lengths, from roughly 10 in. to nearly 4 ft. The systems are line voltage, and many allow fixtures to be linked either directly or through short extension cords.

### HALOGEN AND XENON

These are great for lighting display spaces because they produce a brilliant light that renders colors dramatically. When spaced closely enough, they also illuminate work surfaces well. The small puck fixtures can go practically anywhere—recessed in a case top or mounted under a shelf or cabinet bottom. Systems can be either line voltage or low voltage. The low-voltage systems burn cooler but require a transformer, which can complicate the wiring installation.

### INCANDESCENT

These provide warm, soft light for general illumination inside a cabinet. Their light is not nearly as intense per watt as halogen or xenon bulbs, and they do not render color boldly or as well. They do, however, generate heat, and the can fixtures especially will need proper ventilation. Line-voltage fixtures can use common, inexpensive bulbs.

### LED

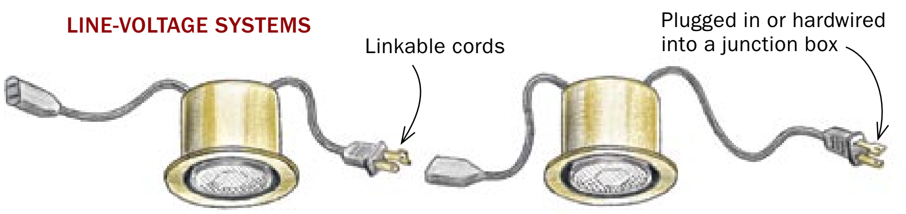
The rope lights, which operate on line voltage, make great back- and top-accent lighting for built-ins. Also, low-voltage LED pucks and strip lighting are becoming increasingly popular as over-counter and furniture light. The bulbs are amazingly efficient, using very little wattage and generating no heat. They also last forever. They're still pricey, though, and some might find their light output too weak and unnatural.

Photos, this spread: John Tetreault; facing page (top right): Michael Fortune

# Wiring 101

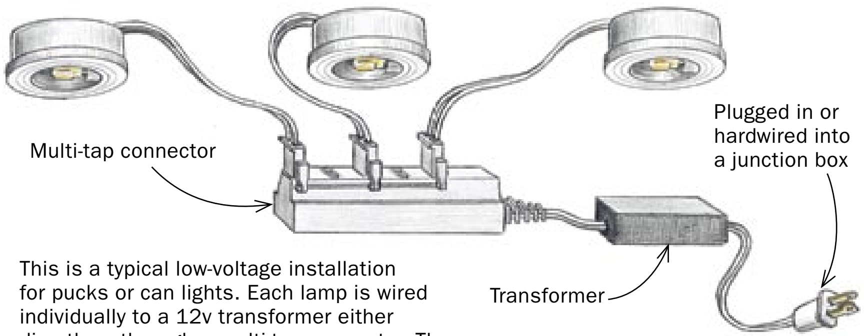
Many systems sold at home and lighting centers are easy to wire, especially if you'll be plugging them into a wall socket. Most also can be hardwired directly into the home's wiring, though you may need to consult an electrician.

### LINE-VOLTAGE SYSTEMS




Many line-voltage systems are sold as kits in which the fixtures can be connected to one another via linkable extension cords. The first lamp in the string is either plugged into the wall or hardwired into a junction box.

### LOW-VOLTAGE SYSTEMS




This is a typical low-voltage installation for pucks or can lights. Each lamp is wired individually to a 12v transformer either directly or through a multi-tap connector. The transformer can then be plugged into a wall receptacle or tied into the household wiring. In either case, a switch or dimmer can be installed between the transformer and the power source. A 60-watt transformer can power a maximum of three 20-watt bulbs. If you want more lights, you'll need a second transformer.

¼-in.-thick top. I do the latter when the top of a piece is in view from a second story looking down.

You'll want to center each fixture, front to back, and then determine how many fixtures are necessary to properly light across your space. In general, 18 in. on center will work for incandescent, halogen, or xenon cans and pucks. With glass shelves, one lamp can illuminate a case from top to bottom. I set my glass shelves in rabbeted frames made from stock that matches the case construction.

Very often this kind of lighting is done using puck lights with halogen or xenon bulbs. Most puck-light kits come with mounting brackets that let you attach the fixture directly to the underside of a shelf or cabinet top. This approach is more obtrusive but easier to install, especially in retrofit jobs. Most fixtures also can be recessed so that only the trim is

## How to hide it



***Be creative.*** *In this spare display case, Michael Fortune hid the transformer and switches under the base. Wiring runs up one vertical frame member, in a groove covered by an unobtrusive cap (matched ebony wood grain).*



***Built-ins offer plenty of cover.*** *Transformers can be placed either on top of a cabinet system or inside it. For this bookcase, builder John Tetreault used the corner cavity where the two cases meet to drop the wiring down to the power source. A removable panel in the bottom shelving unit allows access to the transformers and connections.*

## Switches

For systems not controlled by a wall switch, a variety of in-line switches can be mounted in a convenient but unobtrusive place such as behind a face frame or under a shelf or top.



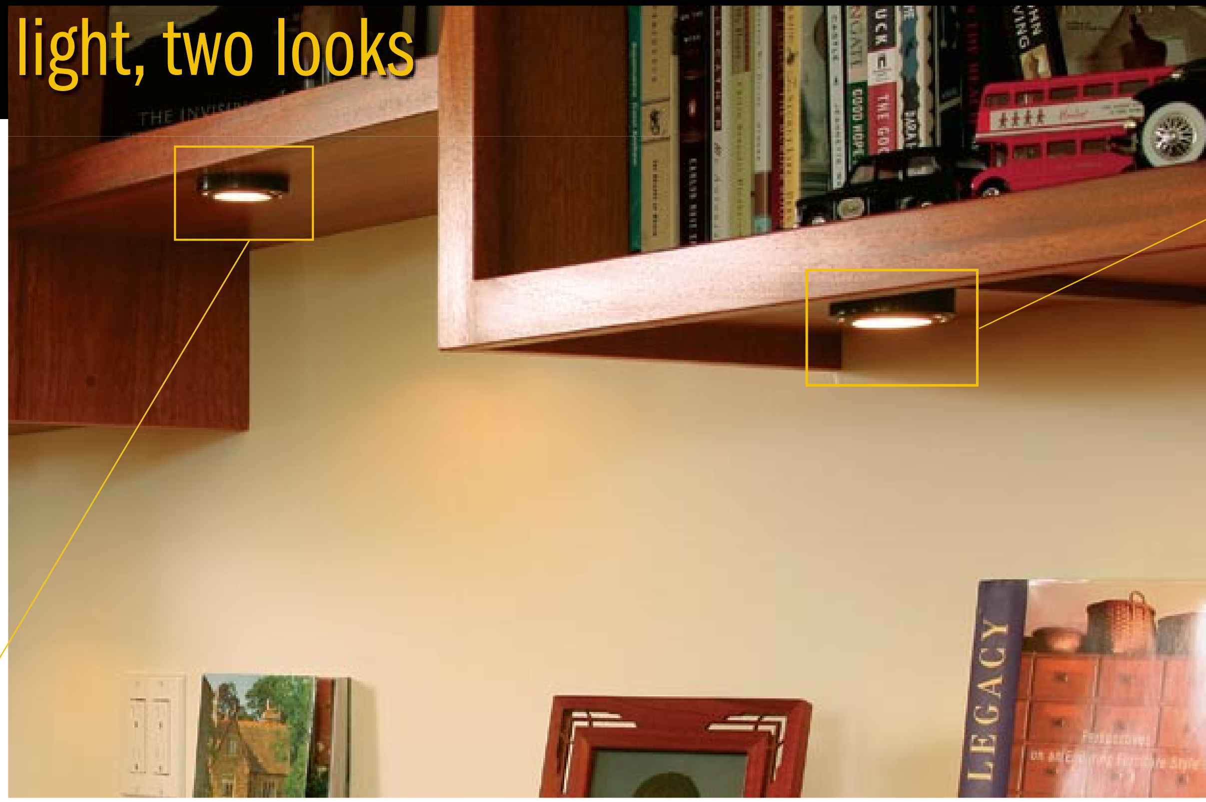
***Turn out the lights.*** *Or just turn them down a little. In-line switch varieties include a simple roller switch, very small rocker switches, and dimmers that operate in steps. For low-voltage systems, be sure the dimmer and transformer are compatible with one another.*

Drawings: John Tetreault

# One light, two looks

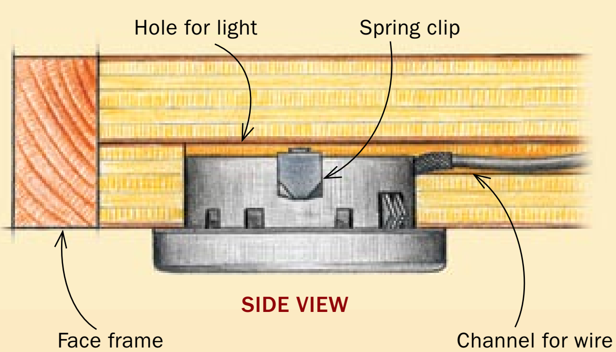


Most puck lights come with a detachable housing that allows them to be either recessed or surface mounted. The lamp at left, with the housing removed, is recessed into the shelf bottom. On some models, spring clips help hold the fixture in the recess. The wiring is concealed inside the shelf itself and the fixture hides behind trim on the front. The lamp at right is surface mounted, with its wiring concealed by wooden trim. The face frame extends below the shelf and conceals the puck at eye level.




## RECESSED

To recess a low-voltage puck under a cabinet, sandwich the wires in a double-thickness shelf. This is not recommended for line-voltage systems.






***Layout for a recessed light.*** *Casey starts by marking the shelf bottom for the location of the fixture.*



***Cut the hole.*** *Casey uses a drill-mounted hole saw, cutting halfway from each direction to avoid damaging the face veneer.*



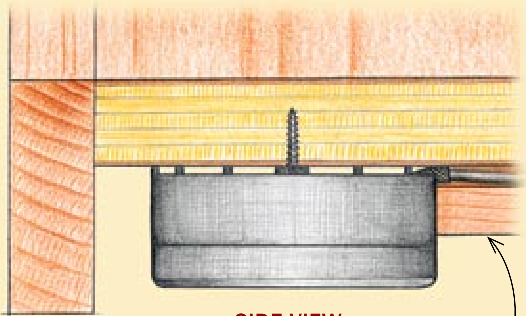
***A dado creates a channel for the wiring.*** *Use a chisel to soften the transitions and prevent sharp corners from damaging the wire.*



***A rabbet continues the path.*** *A rabbet along the back of the shelf carries the wire to a corner, where it can be routed to a transformer or multi-tap connector.*

## SURFACE-MOUNTED

Surface mounting is quicker and easier. Casey uses a spindle sander to shape the end of the trim so that it butts snugly against the fixture.







***Another way of hiding the power.*** *A grooved piece of narrow trim fits over the wire (left) and is pinned in place (right). Make the trim wide enough to provide an adequate nailing surface on either side of the groove.*

showing. For lights recessed in the top of a display cabinet, the holes for the fixtures can be drilled either before or after the case is assembled. The tops of the lighting fixtures and the wiring are concealed behind crown molding and can be run into a transformer or junction box also sitting on top of the piece

**Lights over a counter—**This is another simple and very common lighting installation. Typically, the lights are mounted underneath an upper cabinet.

In the case of over-counter lighting, it is typical for the upper cabinets to be around 12 in. deep, while the lower cabinets and countertops are 20 in. to 24 in. deep. If you want good dispersion of light, you should bring the fixture as far forward in the upper cabinet as possible. This will direct the light to the center of the counter you are lighting.

With surface-mounted lights, whether they are pucks or fluorescent tubes, I usually tuck the fixture behind a reveal. You can do this with a simple skirt or solid edge overhang or, if the upper cabinet is fitted with doors, you can make the doors and exposed sides overhang the bottom of the case. I measure the height of the fixture itself and then add ½ in. to 1 in. for the reveal space. If the fixture (when mounted) is 1 in. tall, I'll make the reveal 1½ in. to 2 in. deep.

Surface-mounted lights allow for surface-mounted wiring as well. I like to make simple grooved trim pieces of matching wood and cover the wiring for a more attractive installation. I pin them in place with a micro-pinner (no glue) so they are easily removed for service.

Recessed puck lights also can be installed under an upper cabinet (see photos, facing page). In this approach, the trim that conceals the fixtures need not be as wide.

**Lights behind a cabinet—**This concept is the same if you are using a rope light to backlight or top-light a piece. I usually make the reveal 2 in. by 2 in. and then tuck the rope into the corner of the reveal with the clips that come with the rope-light kit. For more intensity of light you can paint the faces of this reveal white to work as a reflector. □

*Steve Casey designs and builds furniture near Los Angeles.*

## Glass shelves



**With glass shelves, a single light can illuminate an entire cabinet. Mounting the shelves in rabbeted wood frames (below) keeps the design of a piece consistent.**



# Ultimate Crosscut Sled



## Achieve the accuracy of a sliding tablesaw for a fraction of the price

BY JOHN McCORMACK

With a bit of support at the outfeed end, most tablesaws excel at ripping—whether wide panels or long boards. Crosscutting these pieces is a different story.

Many commercial shops own large, industrial sliding-table tablesaws that make these cuts safely and accurately. But the options for a one-man shop on a limited budget are less attractive. Even an expensive aftermarket miter gauge has a relatively short stroke, and cutting steadily is difficult because of friction between the workpiece and the saw table. Many folks make a traditional carpenter's crosscut sled, with front and back hardwood fences and a pair of runners to engage the miter-gauge grooves. When accurate, these sleds are very useful, but the fences tend to warp and bow, and you have to shim them with masking tape. Another disadvantage is that these sleds lack a built-in measuring tape and stop system. The resulting cuts are seldom truly square or accurate. Last, the back fence limits the crosscut capacity.

A third alternative is to build this sliding crosscut sled that I first encountered at the Program in

**LARGE PIECES AND REPEAT CUTS**

Used in conjunction with the sled horse (p. 69), the crosscut sled can cut very large pieces safely and accurately. Crosscutting an 8-ft.-long piece of plywood is possible (left). The flip-stop on the sled's fence allows you to make accurate and repeatable crosscuts (right) on stock up to 56 in. long.





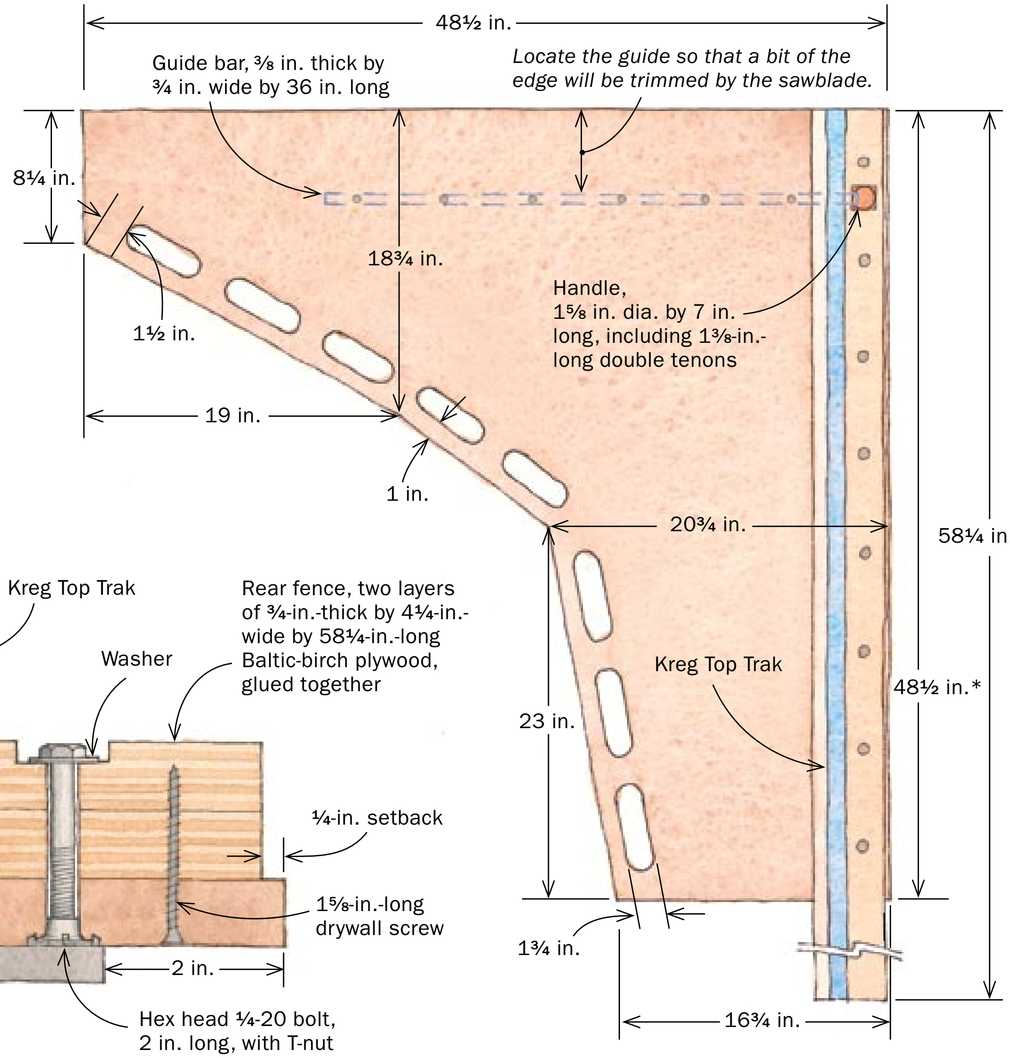


Photos: Mark Schofield; drawings: Jim Richey

## A NEW APPROACH

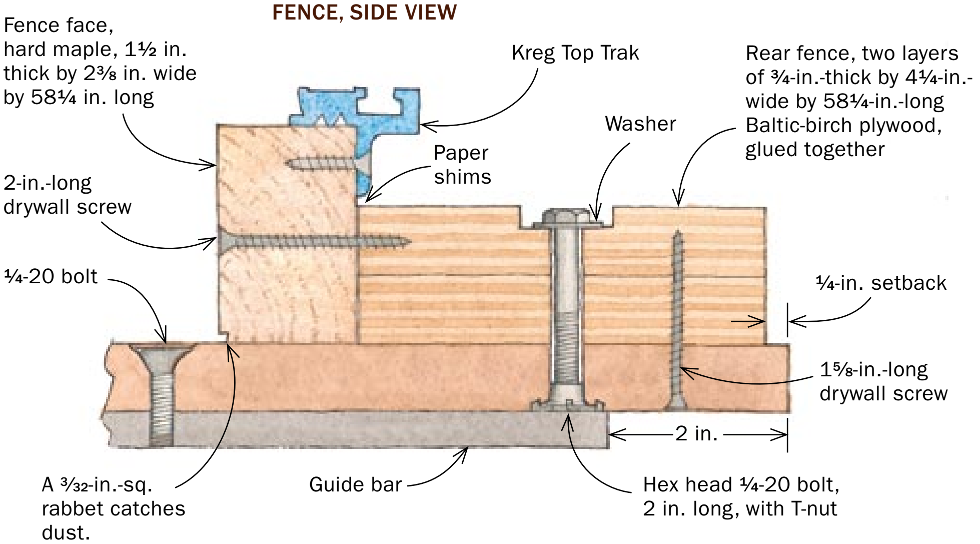
**The triangular shape is designed to support large pieces yet minimize the weight of the sled, while the handholds make the sled easier to carry on and off the saw. The 36-in. miter bar gives the sled a similar crosscut capacity. The single bar rides in the left-hand miter-gauge slot, so with your right hand on the dedicated handle, your body is safely to the left of the blade, unlike with a carpenter's sled. The two-part fence is designed not to bow and has a flat face that can be adjusted if necessary. It is perfectly square to the blade. The sawkerf marks the edge of the sled, making for easy layout and splinter-free cuts. Finally, a track-mounted stop, keyed to a self-adhesive ruler, ensures precise, repeatable crosscuts.**

### TOP VIEW




*Standard MDF sheet is 49 in. wide.

### FENCE, SIDE VIEW




Artisanry at Boston University. Carefully made, it will crosscut large panels and long boards accurately, squarely, repeatably, and safely. This wide sled relies on extra support at its outboard end. On p. 69, I've included plans for a versatile sawhorse that will handle this job and many others.

### Construct the bed and an adjustable fence

The bed of the sled is made from ¾-in.-thick medium-density fiberboard (MDF), which is flat and durable. Cut the initial square on the tablesaw, and then use a jigsaw to remove the triangular waste piece and make the cutouts. Round over the edges of the cutouts and just the upper edges around the perimeter. Keep the lower edges square to reduce dust getting under the sled.

Mark the location of the miter-slot bar so that the sled overhangs the sawblade position by ¼ in. This will be cut flush once the sled is finished.

**A plywood fence is screwed to the bed**—To get perfectly square crosscuts on any length of wood, the fence must be absolutely straight over



## Make the bed

***Start with a square of MDF.*** *Clamp it to a pair of sawhorses and cut away the waste section.*



***Cut out the handholds.*** *Multiple handholds make it easier to maneuver the bulky sled on and off the saw, and also slightly reduce the weight.*

# Add the fence and guide bar

## 1 ATTACH THE REAR PART OF THE FENCE



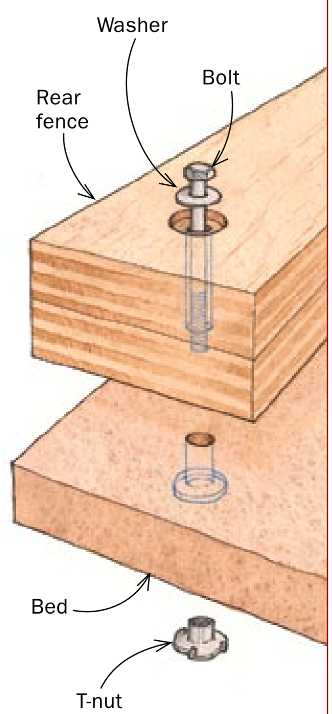
***Locate the fence.** After drilling holes in the rear section of the fence, square it to the bed, clamp it, and tap a drill bit with a hammer to mark the location of the holes.*





***Customize the nuts for MDF.** Designed to penetrate wood, the long spurs on the T-nuts need to be shortened to go into MDF. Attach a nut and a T-nut to one of the bolts used to secure the plywood fence to the bed of the sled. Working on the left-hand side of the T-nut so that the force pushes the nut onto the bolt, gently grind away about half of each spur.*

### BOLT THE REAR FENCE TO THE BED




its length. To achieve this, the fence has two parts: a plywood rear section that is screwed to the bed of the sled, and a hardwood face that is added later. The rear piece gives the fence its stiffness. It consists of two layers of ¾-in.-thick Baltic-birch plywood laminated into a 1½-in.-thick by 4¼-in.-wide bar. True this up after lamination.

Lay out the fence-attachment holes so they miss the location of the miter-gauge bar. Using a Forstner bit, counterbore ⅞-in.-dia. holes, 5⁄16 in. deep, into the top of the fence. Then use a brad-point bit to bore 5⁄16-in.-dia. holes through these counterbores and through the fence.

Lay the fence on the sled table ¼ in. from the edge nearest the operator. That way, if the sled is knocked, the blow is absorbed by the bed and won't knock the fence out of alignment. Square the fence to the line marking the location of the guide bar, and clamp the fence to the sled table. Place the 5⁄16-in.-dia. brad-point bit in the fence holes and tap the bit with a hammer to transfer the location to the MDF. On a drill press with a fence, use a 1⁄16-in.-dia. bit to transfer the hole location to the underside of the sled. Turn over the bed and use a 1-in.-dia. Forstner bit to counterbore 3⁄32-in.-deep holes for T-nuts. Finally, bore all the way through the MDF with the 5⁄16-in.-dia. bit.

Before you attach the fence to the bed, you need to add a handle located right over the miter-gauge bar. I turn my handle on a lathe and double-tenon it into the fence, but you also can use a thick dowel glued into a drilled hole. Make sure the handle is far enough back on the fence so the flip-stop (added later) will slide by.

The fence is attached to the bed with ¼-20 bolts screwed into T-nuts sunk into the recesses in the bottom of the bed. Because the spurs on the T-nuts are designed to bite into wood, shorten them on a grinder so they'll work on MDF (see photos, above).

**Add the guide bar—**Turn the sled over so that both the fence and the location of the guide bar overhang the bench. The guide bar is attached to the bed with machine screws, but this involves drilling and tapping holes in the bar. If you've never done this, I suggest using a piece of extruded aluminum for the bar. Relatively soft, it drills and taps easily, but because the tolerances are less than for steel, you will have to dimple one side to create a tight fit in the miter slot. Mild steel is harder to drill



***Attach the fence.** Tap the T-nuts into the underside of the sled, slide ¼-in.-dia. bolts through the fence, and then use a socket wrench to drive the bolts into the T-nuts.*

## 2 ATTACH THE GUIDE BAR



***Drill and tap the guide bar.*** *McCormack uses a #7 drill and then taps the bar to take ¼-20 machine bolts.*





### A machinist's trick



**To create a tight fit in the miter slot, use a center punch to create dimples on the side of the guide bar nearest the blade. Place dimples ⅛ in. from the top of the bar, starting ¼ in. from the ends and spaced every 3 in. File the dimples to fine-tune the fit.**

and tap but will wear better. Both bars are available at www.onlinemetals.com (aluminum, part No. 6061 T6; steel, part No. 1018 CF).Clamp the bar at the location you marked earlier, drill through both bar and sled, and then tap them with a ¼-20 tap. With the bar still clamped, working from the underside, countersink the holes on the top of the sled and screw flat-head machine screws through the sled into the bar.

The second part of the fence, the hardwood face, gets a 3/32-in.-sq. rabbet on its bottom front edge so dust can collect there instead of pushing the workpiece out of alignment during multiple cuts. You also need to drill and countersink holes in the face to attach it to the plywood back.

The top of the fence face receives a Kreg Top Trak, which comes in 4-ft. and 2-ft. lengths. You'll need two sections of track to extend the length of the 5-ft. fence. Drill and countersink holes along the track and attach it to the fence face with wood screws. Clamp the two sections of fence together, place shims between them to ensure that the face is dead flat, then screw them together.

### Adjust the fence to cut square

Make the first cut on the sled to trim away the ¼-in. overhang on the bed and the fence. Then, to square the fence, make test cuts on a 2-ft.-wide by about 20-in.-long plywood panel. The panel needs a true edge to ride against the fence face, so handplane or edge-joint it dead straight. Make the first crosscut, flip the panel 180°, and cut the opposite side with the true edge of the board still against the sled. Measure the board's width near the sled fence and then at the far end of the board. If the fence is not at 90° to the sawblade, this test cut will double the observable error.

If the second measurement is greater than the first, you are cutting at more than 90°. Put a fine pencil mark on the sled's bed in

## 3 ADD THE FACE OF THE FENCE



***A straight fence.*** *Clamp the two sections of fence together, and use pieces of paper as shims until a straightedge verifies that the front of the fence is perfectly straight.*



***Join the two fences.*** *Once you're certain the face of the fence is straight, use 2-in. drywall screws to attach it to the back section of the fence.*

## Square the fence



***The first cut.*** *With the fence and miter bar attached, you can trim the bed flush with the blade. If you push the sled into the blade, very little of the miter bar is engaged in the slot at the start of the cut. It is safer to raise the blade through the first few inches of the sled.*

front of the face, unlock all but the right-hand attachment bolt, and rotate the fence slightly clockwise. The ¼-in. bolts in the 5⁄16-in.-dia. holes give you enough play. If the second measurement is less than the first, rotate the fence counterclockwise. Relock the fence and make two new test cuts. Keep adjusting until you are cutting a true rectangle. Then drive countersunk drywall screws through the underside of the bed into the plywood fence.

Apply a strip of right-to-left self-adhesive rule to the Top Trak, and then calibrate the cursor on the Kreg flip-stop.

### Safe operations while using the sled

You are now ready to make perfect, square crosscuts and cut boards to the same length time after time. However, you should take precautions if you work near the capacity

#### TEST CUTS ENSURE THE FENCE IS SQUARE



***The first cut.*** *Take a piece of plywood, about 20 in. sq., with one side perfectly straight. Place this side against the fence, mark the opposite side with a triangle, and cut one of the adjacent sides using the sled.*



***The second cut.*** *Flip the test board 180°, keeping the same side against the fence, and cut the side opposite the first cut.*



***Measure the difference.*** *Measure the width of the board adjacent to the fence and at the opposite end. If there is a difference, the fence isn't perfectly square to the blade.*



***Adjust the fence.*** *There is a small amount of play in the bolt holes. Place a pencil mark on the bed of the sled next to the fence, loosen all but the right-hand fence bolt, and pivot the left-hand end of the fence forward or backward. Tighten all the bolts and make another pair of test cuts.*

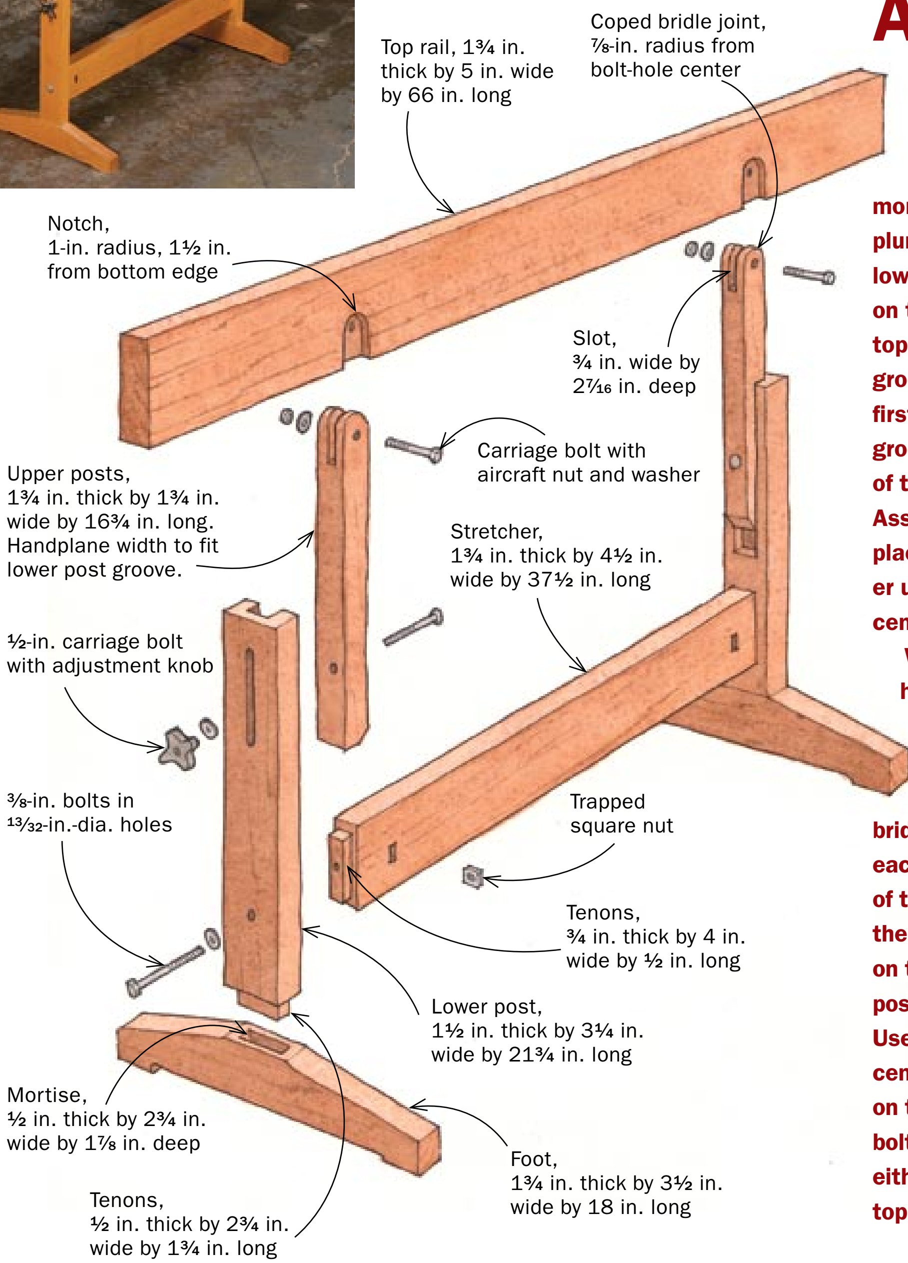
limits of the sled. When making a wide offcut, use a catcher keyed into the right-hand miter gauge and sitting level with the sled. This will support the offcut and prevent tearout near the end of the cut.

If you crosscut at the maximum width, be very careful that the sled does not seesaw out of the miter-gauge groove at the start of the cut, causing the sled and the workpiece to kick back. You'll also find it helpful to have an outfeed table for your saw; otherwise the sled could fall off at the end of the crosscut. It's a good idea to hang the sled on the wall when not in use so that it doesn't get damaged. □

*John McCormack is a furniture maker and woodworking teacher in San Francisco, Calif.*



# Build an adjustable sawhorse




**Although designed to be used with the crosscut sled, this sawhorse, or a pair of them, finds numerous uses in my shop. Finish-mill the parts to the correct dimensions, but leave the upper posts $\frac{1}{32}$ in. extra thick to be fit to the lower post grooves later. Lay out and cut the trestle-foot mortises, using either a hollow-chisel mortiser or a plunge router, and then cut and fit the tenons on the lower trestle posts. Bandsaw the reliefs and tapers on the feet. Lay out the height-adjustment slots in the top outside faces of the lower posts, and the stopped grooves on the top inside faces. Plunge-rout the slots first, only just deeper than needed. Then dado the grooves and chop them square. Clean up the surfaces of the lower posts and feet, and glue them together. Assemble them to the stretcher and clamp them in place. Bore the holes for the bolts in the lower stretcher using the hole in the post as a guide, aiming for the center of the nut mortise.**

**With the base assembled, you can work on the top half. Handplane, scrape, or sand the upper posts to fit the stopped grooves in the lower posts. Bore holes for the ½-in.-dia. carriage bolts and chop the square relief for the bolt shank. The coped bridle joints allow the upper rail to pivot if the height of each leg needs to be different. Lay out the female part of the coped bridle joint on the upper post and bore the top ends for the $\frac{5}{16}$-in.-dia. bolt. Cut the bridle joint on the tablesaw and round the ends. Attach the upper posts to the lower base with ½-in.-dia. knobs and bolts. Use the tight structure to lay out the location of the centers of the two male parts of the coped bridle joint on the lower edges of the upper rail. Bore the $\frac{5}{16}$-in.-dia. bolt holes first, and then plunge-rout away the waste on either side of the male part of the bridle joint. Wax the top rail, assemble the horse, and put it to use.**

*__Set up the sled horse.__ Use a level to ensure that the top rail of the horse is even and parallel with the top of the tablesaw. The coped bridle joints allow the horse to be used on uneven floors.*






*__Mark its position.__ Once you have the sawhorse set, mark the point where the stiles meet, and where the feet are located on the floor. Now you can use the horse elsewhere and reset it quickly.*



*__Locking blocks.__ If you are worried about the combined weight of the sled and a heavy workpiece causing the horse to shift, clamp a custom-size block into the gap below the upper stile.*

# How to Tackle a Serpentine Drawer

## From drawer fronts to table aprons, this veneered shape has many uses

BY JEFF HEADLEY

The serpentine shape is a simple yet pleasing form, which explains why it is found on so many types of furniture. However, its design and construction are not so simple. Although there are some antiques that were made by cutting serpentine shapes from solid wood, this represents a huge waste of high-priced lumber and the result is relatively heavy and coarse looking.

The method I used on the drawers in this chest is more straightforward. Build the core from 1-in.-thick layers of poplar, veneer the curved surface, fit the drawer front to the opening in the chest, and apply cock beading





around the drawer. You can use this technique on any serpentine piece, from drawers to table aprons.

### Build the core from secondary wood

Before you start on the drawers you should build the rest of the carcase, as the drawers are built to fit the opening and not the other way around. The other serpentine-shaped parts, the top and the drawer dividers, are easily cut on the bandsaw.

There are two ways to make the serpentine core, but for both, use the pattern from the chest rails to lay out the 1-in.-thick cores, leaving them 2 in. long. I make the core by gluing layers of boards until they equal the height of the tallest drawer front. They should be wide enough to accommodate the number of drawer fronts, plus the depth of the serpentine, plus enough scrap to be used as a caul for veneering. This large blank is heavy and awkward, so be careful when cutting it on the bandsaw. Try to cut cleanly; time spent here will pay dividends in less cleanup time.

Use spokeshaves to clean up the surface. A flat-bottomed spokeshave works on most areas, with a curved one getting into the bottom of curves. Remove the sawmarks evenly

***The drawers are the trick.*** *If you can handle the veneered drawers on this serpentine chest, you'll have no problem with the rails and top, which simply are sawn from solid wood.*

## Two ways to make the core

### 1 CUT FROM ONE BIG BLOCK

***One block yields several cores.*** *Build up layers until they match the height of the tallest drawer. Use a template for layout and then cut out the individual cores on a bandsaw.*



***Rip the core.*** *Cut the core to the correct height for the drawer opening by ripping it on the tablesaw.*



***Clean up the bandsaw marks.*** *Use flat and curved spokeshaves to clean up both sides of the core.*

### 2 ONE LAYER AT A TIME



***Multiple layers from one board.*** *To bandsaw less wood at once, lay out multiple layers of core on one board and then bandsaw them out.*



***Clean up one at a time.*** *After smoothing one layer, glue a bandsawn layer below it and use a template bit to clean it up. Glue on each successive layer and smooth it with the template bit.*

Photos: Mark Schofield

# Fit the core to the case



***Mark the correct length.** Use an offcut of the drawer core as a template to mark the correct length of the drawer and the angle at which to cut the ends.*



***Flush-fit the drawer front.** With the drawer front cut to height and width, place it in the opening and mark any areas on the face that need to be trimmed flush with the carcase. Use the spokeshaves to do so.*

across the width of the core to keep the thickness even. With today's thin veneers, you must be very thorough in cleaning up the core because any ripple will transfer through the veneer.

**Bandsaw too small? Try this—**If your bandsaw's resaw capacity is limited, or if you'd rather not maneuver a large block of wood on a small bandsaw table, you can construct each core individually using layers rough-cut to the serpentine shape. Smooth the first layer with a spokeshave or a spindle sander, and then glue it to a rough-cut section. Clean up the rough section on the router table using a flush-trimming bit bearing on the smooth layer above. Keep adding layers and trimming them until you reach the height of the drawer front.

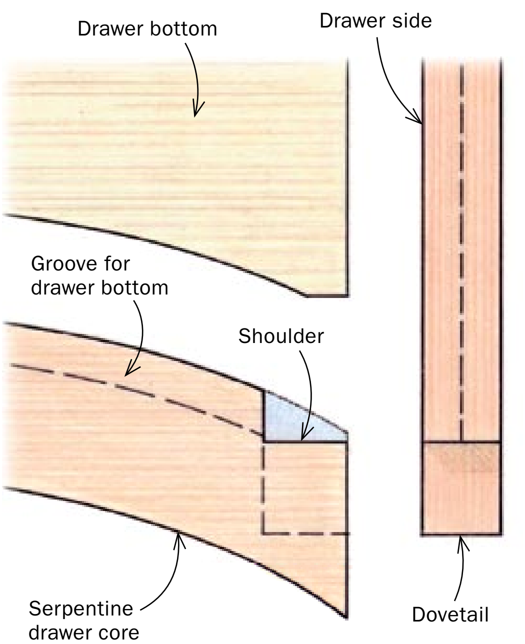
### Fit the serpentine blanks to the drawer openings

When cutting the drawer fronts to height, I always start with the tallest; if I make a mistake I can use it for the next size down. The waste from the smallest drawer front can be used for a serpentine skirt on the cabinet, if the design calls for it.

To cut the fronts to width, place a scrap of drawer-front core against the front of the relevant drawer rail, and lay a straightedge inside the case flush with the side and over the pattern. Draw a line for the angle on the pattern, repeating the process on the other side. Make sure not to shift the pattern left or right. Finally, mark the center point on the pattern.

This gives the total width for the drawers and the angle the sides need to be cut to. Transfer these points to the drawer front, then cut it on the miter saw or bandsaw. Clean it up and fit it to the drawer opening. Once the drawer front fits snugly, adjust the face by trimming any proud area with a spokeshave so that it mirrors the profile of the rails. Next, cut a groove near the bottom in the back of the drawer front using

#### CUT THE JOINERY BEFORE ADDING THE VENEER






***Create a shoulder.** Mark the back corners of the core to create a square shoulder for the drawer sides. Darken your scribe lines with a pencil.*



***Lay out the pins.** Use a piece of wood the thickness of the drawer bottom to align the grooves on the drawer front and side. Mark the location of the pins on the drawer front.*



Drawings: Vince Babak



# Curved veneer made easy

***Mark the centers.*** *To help you align the veneer quickly during gluing, mark the center points of both the core and the veneer (left).*



***Align the veneer.*** *After you apply white glue to the veneer and the core, hold the veneer in place with masking tape to prevent it from shifting when pressure is applied.*



***The core as a caul.*** *You can use either another serpentine core or the remains of the block from which the cores were bandsawn as a clamping caul.*



***Trim the edge.*** *Use a wide chisel to pare the overhanging veneer flush with the core.*

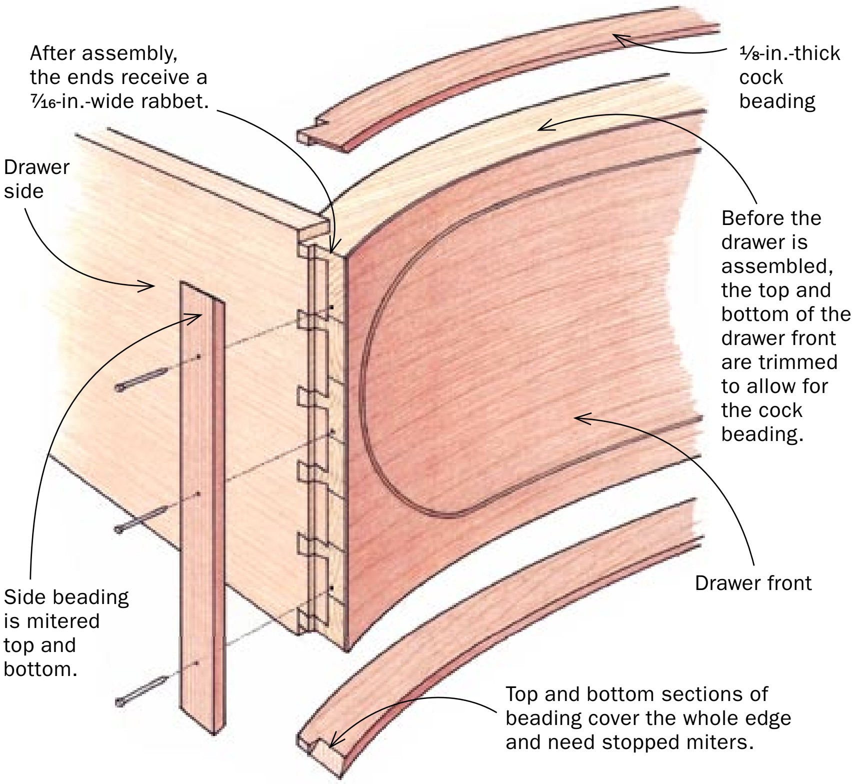
a ¼-in.-wide rabbeting bit in a router table. This will receive the drawer bottom and will help align the sides with the drawer front when laying out the dovetails.

I have found that it is a good idea to cut and fit the dovetails before veneering. If the drawer front shifts slightly after you cut the dovetails, you can go back and readjust the fit of the drawer front to the opening. Once it is veneered, you can make adjustments only by shifting the cock beading, which gives you much less flexibility. So, once the drawer fronts are fit, use a marking gauge to scribe a line on the top and bottom extending in from the ends the thickness of the drawer sides. Then mark a line in from the end and perpendicular to it, from a point roughly 1 in. from the front of the drawer. The distance should be the same on both ends. This gives a shoulder for the dovetails. Cut the tails on the drawer sides, and then lay out the pins.

## How to veneer a serpentine surface

Lay out the veneer in whatever design, shape, or pattern you want, but always start from the center. If you are doing a book-match, or using successive slices of veneer on multiple drawer fronts, it is vital to mark the center point on the veneer and align it with the center of the core. Even if I'm just veneering a single drawer, I still mark the centerline. Once glue has been applied, it is much easier to align the center and start clamping from there rather than checking if all four corners are in place. Cut the veneer at least ½ in. larger than

# Edge beading completes the look




**1** **TRIM AND RABBET THE DRAWER**

***Measure for cock beading.*** *With the drawer front pushed slightly into the opening, use a section of cock beading and a knife to score where to cut away the drawer front.*



To add the oval inlay to the drawer fronts, see Master Class on pp. 92-94.



***Reduce the height.*** *Use a jointer followed by a handplane to reduce the drawer height to the scribed lines for the top and bottom sections of cock beading.*




***Assemble the drawer and trim the ends.*** *Use a straight bit in a router to cut away the ends of the drawer front. Rout close to the scribe line, and finish the job with a chisel.*

needed all around. I glue both the core and the veneer with Elmer's white glue, which has a long open time. With the two centerlines matched up, tape down the veneer with blue painter's tape. This keeps the veneer from squirming when clamping pressure is applied.

Lay a sheet of plastic or 1⁄8-in.-thick packing foam over the veneer, then a piece of old carpet with no more than a 1⁄2-in.-thick pile, followed by a slice of 1⁄4-in.-thick plywood or bending plywood cut slightly larger than the drawer front. Last, lay on the core of the largest drawer front or the balance of the block from which the cores were cut and clamp the assembly as hard as you can. Always start clamping at the center and go out. This pushes any glue toward the ends rather than toward the center, where it would bubble. Wait about an hour and then remove the clamps and cauls. Peel away the blue tape and scrape off any glue that has leached through. It is much easier to do this after the veneer is stuck down but before the glue hardens. Reclamp the assembly and let it sit overnight. The next day, trim the veneer flush using a wide bench chisel.

## Beading protects the veneered edges

If you decide to add fine lining to the drawer front (see Master Class, pp. 92-94), do it at this stage.

Dry-fit the drawer sides and back and slide the drawer into the case until the front is just inside the carcase. Take a small piece of cock-bead material and, running it along the drawer rails and the carcase sides, scribe a line around the edge of the drawer front. The purpose of the cock beading is to fit the carcase opening, not to mirror the dimensions of the drawer front. Then take the drawer box apart and cut down the top and bottom of the drawer front to the scribe line. You can remove the bulk of the waste on a jointer and fine-tune the cut with a handplane.

## 2 MAKE AND ATTACH THE BEADING

***Cut out the beading and miter it.*** *Transfer the shape of the drawer front to the cock-beading stock, leaving the front 1/8 in. proud (right). The top and bottom sections of beading have stopped miters (far right) to receive the end sections. The notch is to allow for the drawer sides.*









***Top and bottom, then sides.*** *Offcuts from shorter drawer cores are used as cauls when clamping the top and bottom sections of cock beading (left). For the side cock beading, because the sides of the drawer front are end grain, reinforce the glue joint by countersinking brads (above).*

Now glue and reassemble the drawer, inserting it in the opening to dry. When the dovetails are dry, use a straight bit in a router to cut the sides to the scribed line, but go in only about 7/16 in. It would be a shame to cut beautiful dovetails and then cover them up.

Glue and clamp the top and bottom pieces of cock beading. When dry, use a spokeshave to trim the back of the beading flush and the front about 1/8 in. proud. Next, glue and nail the cock bead on the drawer sides.

I filed a concave round into a small paint scraper for creating the bead profile. Shape the corners with a flat chisel, and then smooth any rough areas with sandpaper. After the drawers are given a final fitting, you have the option of installing locks and inlaying a diamond escutcheon around the keyhole. □

*Jeff Headley is a period furniture maker and restorer who lives near Winchester, Va.*

## 3 SHAPE THE BEADING





***Trim and shape.*** *Use a spokeshave to trim the front of the cock beading until it is just over 1/8 in. proud of the drawer front (left). Headley uses a notched paint scraper to shape the half-round profile on the cock beading (right).*

# Rediscovering Milk Paint



## Get a rich, traditional look or break out of the bag for a wide range of effects

BY NANCY HILLER

Milk paint has been around at least 20,000 years. The Egyptians used it, and it has been found decorating ancient cave dwellings. Woodworkers who specialize in Colonial and Shaker furniture are familiar with it, as milk paint was a common finish on both types of furniture. But milk paint offers interesting possibilities for all woodworkers, from makers of period reproductions to those who prefer contemporary furniture and cabinetry. And it contains no toxic ingredients. This durable and versatile finish comes in a variety of colors and can be used with different topcoat treatments to create unique effects. Opaque surfaces, color washes, layering, and decorative painting are just the beginning.

Many woodworkers are reluctant to try milk paint, concerned that it may be difficult to use. Nothing could be further from the truth. This finish is so easy to mix and apply that you can't mess it up, and slight imperfections will only enhance the finished look.

### What is milk paint?

Milk paint's durability comes from its ingredients. Casein, a protein found in milk, is extremely hard when



Photos, this page and across bottom: Michael Pekovich



# Milk paint 101




***Powder first.*** *To reduce clumping, add some water to the powder, and then stir to a paste before adding the rest. Alternatively, you can add all of the water, cover the mixing container tightly, and shake vigorously for several minutes.*

dry and adheres to a variety of substrates, including solid woods, plywood, and medium-density fiberboard (MDF). Manufacturers mix casein with lime. When combined with water, the lime and casein react to form a natural coating that cures over time, somewhat like concrete. If you want to apply milk paint over some other type of finish, be sure to follow the manufacturer's instructions. You'll usually have to scuff up the existing finish with sandpaper, and then clean the surface with water or vinegar and water. Finally, use a bonding agent (supplied by milk-paint manufacturers) mixed in with the water and powder of the first coat when refinishing.

Supplied as a dry powder, milk paint has a limited shelf life once it is mixed with water, so you should make up only as much as you can use in a day. Unused powder, however, can be stored indefinitely in an airtight, sealed container. Moisture makes the powder unusable, so the trick is to keep out humidity. You







***Work in the first coat.*** *Milk paint soaks into the wood as it is applied. Reapply paint to the brush often, and push the paint into the wood (above left). The second coat glides on more smoothly, like regular paint (above). After two coats, scuff-sand lightly with P220-grit paper (left) and decide if you need more.*




***Endless color palette.*** *You can buy dozens of milk paint colors, and those colors can be mixed to achieve unlimited variations. Mix colors in small batches, keeping track of the ratios so you can duplicate the color in a larger portion.*

Photos, except where noted: Anissa Kapsales

# Topcoats make a big difference

## STEEL WOOL AND WAX



***Wax is simple and easy.*** *After scuff-sanding with P220-grit, Hiller burnishes the milk paint with 0000 steel wool (right) and uses the steel wool to work in a fairly heavy coat of paste wax (below) for a natural look.*



## DANISH OIL




***Oils offer more protection.*** *Apply a generous amount of an oil finish and allow it to penetrate for about 30 minutes (above). Wipe off the excess with a clean, lint-free cloth (right) to give the surface more protection than wax as well as a subtle sheen.*



can purchase many different colors. The paint dries lighter than it looks when it's wet, so test colors on scraps.

Close-grained species such as pine, poplar, and maple will give the smoothest finish under milk paint. While you can use it on open-pored species such as oak or ash, the grain structure will be pronounced and must be considered part of the design.

### Applying milk paint is easy but different from other paints

To prepare the surface, sand to P180-grit and remove dust using a vacuum or tack cloth. Milk paint is not like premixed latex and oil-based paints that form a layer on top of the wood's surface. It's thinner and, when used on clean, unfinished surfaces, is self-priming: The first coat is partially absorbed by the wood and, when cured, forms its own bond coat. This makes applying the first coat very different from applying the first coat of a premixed paint. The wood will absorb the milk paint as you apply it, so don't expect it to glide on. Compensate for this by reapplying paint to the brush more often and dabbing the paint into the wood.

The most common approach is an opaque finish, which obscures the figure of the wood and covers your piece with the intense, velvety color that is milk paint's hallmark. Mix equal parts warm water and powder in a nonmetallic container and stir briskly. Let the paint slake for about 10 minutes. An opaque application is between two and four coats. Although some people recommend raising the grain with a light spray of water before applying the paint, I don't. I find this step to be redundant. Since I am applying multiple coats of milk paint, I'm not worried about sanding through the first coat.



Photos, this page (top and bottom right): Michael Pekovich, facing page (bottom): Dirk Bakker

## POLYURETHANE






***For a tough topcoat, go with poly.*** *Oil-based polyurethanes darken and warm the color of milk paint (left), but they also can change the color, as shown above. Water-based finishes give a colder, brighter appearance, a plus for bright colors and contemporary designs.*

With an inexpensive natural-bristle brush, apply a generous first coat with the grain. Stray bristles or small chunks of undissolved paint can be picked off the surface as you go. Applying a second coat of base color before the first has fully dried seems to help even out the coverage. When the first two coats have dried, scuff-sand with P220-grit paper to a smooth surface and decide whether you need subsequent coats. You can tell a coat is dry by the characteristic papery appearance. Drying time is quick—you can usually recoat in one to two hours—depending on humidity.

Apply as many coats as needed to produce the opacity you want. There is no rule about how many coats to apply. If you want a very smooth finished surface, sand each time between coats. I don't always do this (sometimes I want to achieve a more imperfect-looking surface), but I always sand before applying the topcoat in order to create optimal conditions for adhesion. Let the milk paint dry completely—at least overnight—before protecting it with clear topcoats.

### Topcoats: different looks and levels of protection

Topcoats add protection but alter the color of the paint. The bare finish has a distinctive shaded look with subtle imperfections that can be left natural or burnished to a soft sheen using 0000 steel wool. Milk paint is compatible with almost any topcoat, but topcoating is not required; the paint itself is hard and stands up to normal wear on furniture. However, if left unfinished it will quickly pick up and show oils from fingers. A high-traffic area such as a kitchen or a bathroom will need more protection than a keepsake box, picture frame, or wall shelf. Waxes, shellac, and oils provide less protection than polyurethanes.

Whether water-, alcohol-, or oil-based, topcoats will alter the final look, making it darker. Whichever topcoat you plan to use, prepare the painted surface by sanding with P220-grit paper along the grain, then remove the colored dust.

**Wax, alcohol, and oil-based topcoats—**These topcoats all tend to leave the paint color warmer and darker. Because visually the end result is almost the same, you should consider the level of protection when choosing between them.

Wax, like oil, will darken milk paint. While it is one of the traditional coatings used over milk paint, it won't afford substantial protection from common household substances. Shellac will create a clear, glossy look but give only limited protection against damage by water and oils. Boiled linseed oil and Danish oil are two traditional protective coatings. Apply as many coats as necessary



***Polished and modern.*** *On the clean lines of his contemporary designs, Jose Regueiro brings milk paint out of its traditional role. This dining table has four coats of milk paint followed by two coats of satin polyurethane.*



***Weathered from the start.*** *Milk paint is the logical finish for this traditional cupboard. To achieve the distressed look, D. Andrew Kates layered different colors of milk paint (scraping through layers) over dark brown aniline dye and completed the finish with a dark brown glaze and wax.*

to build up the luster you desire. These oils will darken the paint's color as well as give the piece a subtle sheen and moderate protection. For a more durable finish—necessary in the case of kitchen or bathroom cabinets, for example—use oil-based polyurethane. Like oils, it will darken the paint's tone and give colors a warmer look. It is important to take this ambering effect into account if you are working with blues, which will shift toward green under oil-based polyurethane. If you are concerned about yellowing, you can always use a water-based polyurethane instead.

The availability of matte and glossy finishes adds yet another dimension to consider.

**Water-based topcoats—**Unlike oil-based topcoats, water-based topcoats can make a finish look colder and give it an artificial appearance. This can be a problem over warm colors such as reds and browns. However, this effect can be a positive if the design of the piece calls for a starker look.

Once dry, milk paint forms a coating that is nonsoluble, so it won't dissolve when water-based topcoats are applied. In days past, water-based finishes were not resistant to damage from oil, so you couldn't rely on them to protect a milk-painted surface from such common hazards as a pastry baker's buttery fingers opening cabinet latches in the kitchen. But these days, many

## Layer for an aged effect

***Simulate centuries.*** *Hiller applies a coat of black as a second color over two coats of red and finishes with a coat of green. When the final coat dries, she sands through the layers to simulate years of wear and tear (far right). When figuring out where to sand through the layers, try to find a similar piece of old furniture and imitate wear in the same areas.*









Photos, this page (top left): D. Andrew Kates; facing page (bottom right): Phil Harris

## Go halfway with a washcoat





***Keep grain but add color.*** *Thinning the paint mixture at a ratio of about 1:4 allows you to see the wood's figure through the milk paint.*

**SOURCES OF SUPPLY**

**THE OLD FASHIONED MILK PAINT CO. INC.**
www.milkpaint.com

**THE REAL MILK PAINT CO.**
www.realmilkpaint.com

water-based finishes are as good as, if not better than, their oil-based counterparts and offer full protection from oils, water, and alcohol (see "Waterborne Finishes Come of Age," *FWW* #187). Some even mimic the warm yellow cast of the oils.

### Breaking the mold: special effects

In addition to the opaque finish, you can get a variety of looks with milk paint, depending on how the film is applied.

**Layering—**Layering different colors and then sanding through in spots so that the base hues appear is a good way to age a piece instantly. When you layer different colors, you should use two coats of the base to ensure that the buildup will be adequate. And whenever you switch colors in layering, be sure to let the paint dry well to prevent the wet colors from mixing together.

**Washcoat—**A wash made from a dilute solution of paint adds color while allowing the figure to show. Because the finish becomes more opaque with each coat, I use one washcoat only.

My wood of choice for washcoating is cypress because it's close-grained yet has pronounced figure that shows through under the color. It isn't always accessible at local lumberyards, but I have found a great mail-order source, www.paxtonwood.com. Other woods that could work well with a washcoat are yellow pine, furniture-grade Douglas fir, and maple.

**Decorative painting—**To paint intricate pictures and graphics, mix milk paint as you would any other artist's paint. To cover a large surface, mix larger quantities of dry powder, adding more of particular colors to obtain the look you want. For small designs, you can blend small batches of color on a ceramic plate just as you would on a painter's palette, adjusting hues as you go.

Because the first coat of milk paint soaks into the wood, it's best to decorate on a background that has already been coated at least twice. The consistency should be thicker when you are decorating than when you are covering an entire surface with one color. Test it on a sample piece that matches the piece you'll be painting. Experiment and have fun. □

*Nancy Hiller owns and operates NR Hiller Design Inc. (nrhillerdesign.com) in Bloomington, Ind.*

## Decorative painting



***Release your inner artist.*** *Milk paint is simple to use as a decorative paint. Mix colors to a thicker consistency and apply them with small artists' brushes.*



***Deep textures.*** *Using his furniture as a canvas, Michael deForest paints in layers, sanding through to reveal the colors underneath when necessary. The topcoat is sprayed lacquer.*

# readers gallery



## STEVE HOLMAN
Dorset, Vt.

Holman designed this china cabinet (22 in. deep by 76 in. wide by 84 in. tall) to match an existing Art Deco sideboard that was built between 1920 and 1940, he estimates. From the sideboard, he lifted the shapes of the curves and the exact measurements and placement of various parts and overhangs to incorporate into the new design. Matching the deep honey tones of the original piece was a challenge. After a great deal of testing, Holman finished the mahogany and nogal (a tropical walnut) with stains, orange shellac, and lacquer.



## JASON WALDRON
Launceston, Tas., Australia

Design inspiration for this Australian blackwood chair came from early Australian colonial furniture and the work of Italian designer and architect Gio Ponti. Waldron steam-bent the back splats and used the color-tinged water left over from the process to dye the cotton webbing for the seat. The chair is 17½ in. deep by 16 in. wide by 31 in. tall, and the finish is teak oil.

### Toolmakers wanted

Do you make your own woodworking tools? We want to showcase these shopmade wares in our annual *Tools & Shops* issue. We'd also like to include photos of restored vintage hand tools and machinery. The deadline is July 16. Send entry forms (available at www.finewoodworking.com) and photos (unaltered digital images, prints with negatives, or slides) to Readers Gallery, *FWW*, 63 S. Main St., Newtown, CT 06470, or email fwgallery@taunton.com.

## DANIEL OMONDI ODHUNO
Brattleboro, Vt.

This mahogany and walnut hall table combines Odhuno's love for carving with his desire to make practical furniture for everyday use. His carvings are heavily influenced by the culture, art, and architecture along the East African coast. Finished with linseed oil, the table is 13½ in. deep by 72 in. wide by 31 in. tall.



## FRANK MURPHY
Canton, Ga.

Murphy's father taught him to make models of Lightning-class sailboats and '30s speedboats, but it was *The Dory Model Book* by Harold "Dynamite" Payson that inspired him to build these three dories from Western red cedar and mahogany. In turn, the dories inspired the spalted-maple display case, 11 in. deep by 24 in. wide by 24 in. tall. Finished with shellac and lacquer, it has a removable base for resting on a tabletop or can hang on the wall with a French cleat. PHOTO: DAVIDSON & COMPANY



## MIKE MAHONEY
Orem, Utah

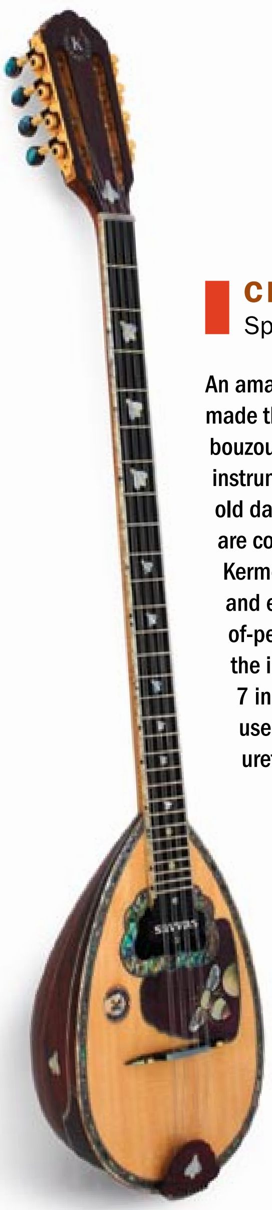
Mahoney made this 16-piece poplar set to create something that could be passed down as a family heirloom but still function in an everyday kitchen. With nearly 15 years of professional turning experience, he was able to complete the set in 25 hours. The knobs are African blackwood, and the finish is varnish.





## JOEL FICKE
Bloomer, Wis.

This highboy was Ficke's first attempt at reproducing early American furniture, and he built it under the instruction of Gene Landon. The original, known as the Gratz Highboy, is a mid-1700s tall chest in the Winterthur museum in Delaware. The piece turned out to be a "carving adventure" that was more challenging than Ficke ever imagined, but the experience marked a transformation in his woodworking abilities. The primary wood is mahogany, and the secondary wood is white pine. The highboy stands 21¾ in. deep by 46⅛ in. wide by 101 in. tall; the finish is aniline dye and shellac.



## CHRIST KACOYANNAKIS
Springfield, Va.

An amateur luthier, Kacoyannakis made this small version of a bouzouki (a traditional Greek instrument) for his 5-year-old daughter. The woods are cocobolo, curly maple, Kermodie spruce, purpleheart, and ebony. The inlay is mother-of-pearl and abalone. To finish the instrument (5 in. deep by 7 in. wide by 34 in. tall) he used KTM-9, a water-based urethane/acrylic finish.



## STEWART CRICK
Manassas, Va.

Crick drew from various Arts and Crafts influences to design this chest of drawers, combining elements of Stickley, Greene and Greene, and Mackintosh. The chest is 21 in. deep by 36 in. wide by 48 in. tall. The quartersawn white oak and ebony are finished with one coat of shellac, six coats of wipe-on polyurethane, and paste wax.

## STEVE NOFFSINGER
Stockton, Calif.



Noffsinger designed this humidor/game box so the lid of the cigar drawer stays in the main box as the drawer opens, allowing the cigars to be inserted and removed without the lid getting in the way, but keeping them sealed when the drawer is closed. Only when a silver dollar "catch" is removed do the drawer and lid come out together. The mahogany and Lebanese cedar box, 6 in. deep by 12 in. wide by 4 in. tall, is finished with shellac.



## W. PATRICK EDWARDS
San Diego, Calif.

Remarkably, this long case clock, based on an original by Thomas Tompion (ca. 1675-1678), was built without a single power tool. Edwards used a combination of hand and pre-industrial tools (some of which are treadle-operated) to create the case and the stunning inlay and marquetry. The clock is 11 in. deep by 19 in. wide by 77 in. tall and is quartersawn oak, with olivewood veneers and marquetry set into a maple burl background. The clockworks are by Hartwig's Clock Co. in Pennsylvania, and the engraved face was crafted in England. The finish is French polish. PHOTO: GLENN CORMIER

## STEVE BARLOW
Dhahran, Saudi Arabia

Barlow used this padauk and ash bench to move away from rectilinear furniture and explore soft curves. The seat and legs were rough-cut on the bandsaw, and then refined with a router, carving gouges, rasps, and a disk sander. The stretcher is a bent lamination shaped with rasps and a sander. The mortise-and-tenon joinery was inspired by "Use an Angle Grinder to Sculpt Flowing Joinery" by Jere Williams (*FWW* #185). The bench, 17 in. deep by 60 in. wide by 17 in. tall, is finished with five coats of hand-rubbed polyurethane.



# Q&A

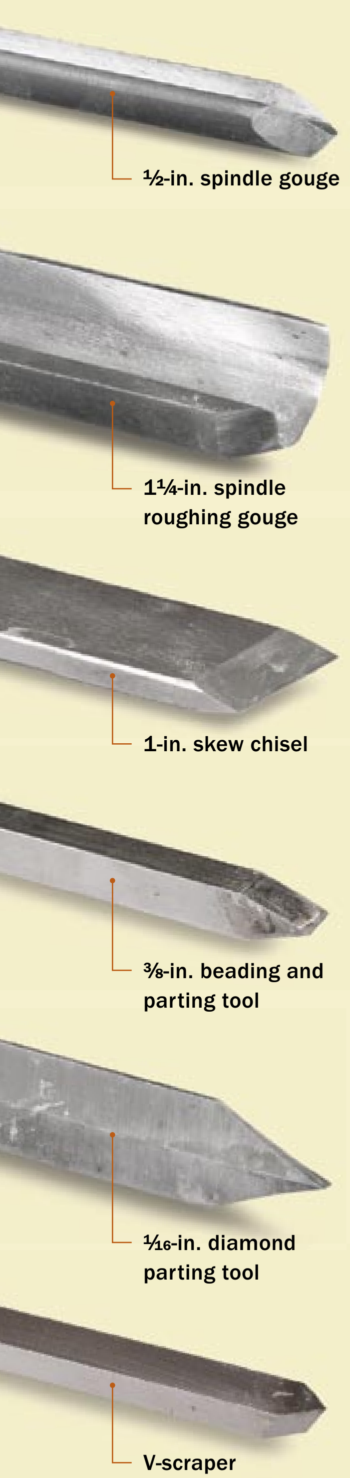
## A turner's basic tool kit



**Buy one at a time.** *A set of turning tools often contains tools you'll rarely need. This group will get you started on spindle and faceplate turning, plus the different handles will let you distinguish one tool from another more easily.*

**Q: I have no turning experience, but my next tool purchase will be a lathe. I plan to turn everything from bowls to chess pieces. Should I buy a full set of lathe tools? Or would I be better off starting with two or three must-haves and adding tools as I begin to specialize?**

—JOE ULLRICH, Grayslake, Ill.




**A:** I FIRMLY BELIEVE THAT A TURNING-TOOL SET represents a very poor value. These sets are compiled by merchandising "experts" who are clueless about turning. The result is a collection of tools of which only one or two are actually worth having.

You should buy only high-speed-steel (HSS) tools and avoid the cheaper carbon-steel ones. HSS holds an edge longer and you do not need to worry about burning it on the grinder. Powdered metal tools are now offered; but I find that they do not hold an edge any longer than HSS yet are often twice the price.

When I was young, it was cheaper to buy tools without handles. I still do that, and size my handles so I can tell a ⅜-in. gouge from a ½-in. one. I also use different designs for spindle tools, faceplate tools, and scrapers to make it easier to grab the tool I want. Even if you don't turn your handles, buying brands with different handles helps you pick out a tool quickly.

*—Ernie Conover is a turner and a woodworking teacher in Parkman, Ohio.*




### I recommend the following starter tools:

**½-in. spindle gouge** A shallow flute is better than a deep one.

**¾-in. to 1¼-in. spindle roughing gouge** The bigger the better.

**1-in. to 1¼-in. skew chisel** Rectangular is the traditional shape, but oval is easier for a beginner.

**⅜-in. beading and parting tool** Great for sizing work with calipers, sizing tenons, and cutting beads.

**¹⁄₁₆-in. or ⅛-in. diamond parting tool** Diamond is superior to a rectangular cross section.

**½-in. V-point scraper** Great for making chucks.

**½-in. bowl gouge** The next size to get is ¼ in.

**1¼-in. dome scraper** The wider and heavier the better.

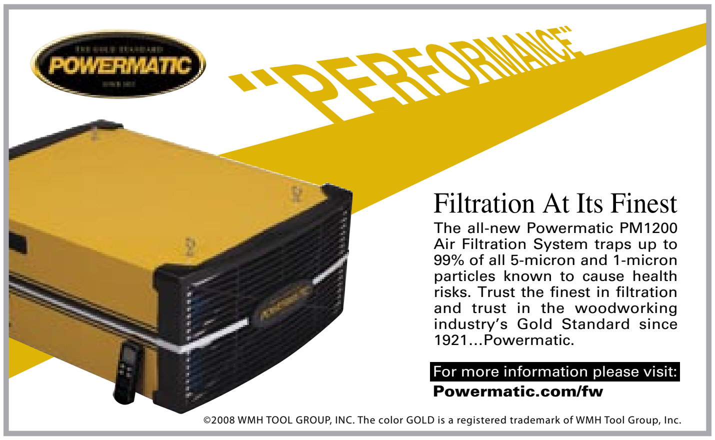
**¼-in. to 1-in.-wide old files, screwdrivers, chisels, etc.** These make great scrapers. Grind them into whatever shape you need.

### Ask a question

Do you have a question you'd like us to consider for the column? Send it to Q&A, *Fine Woodworking*, 63 S. Main St., Newtown, CT 06470, or email fwqa@taunton.com.



Photos, this page: Ernie Conover



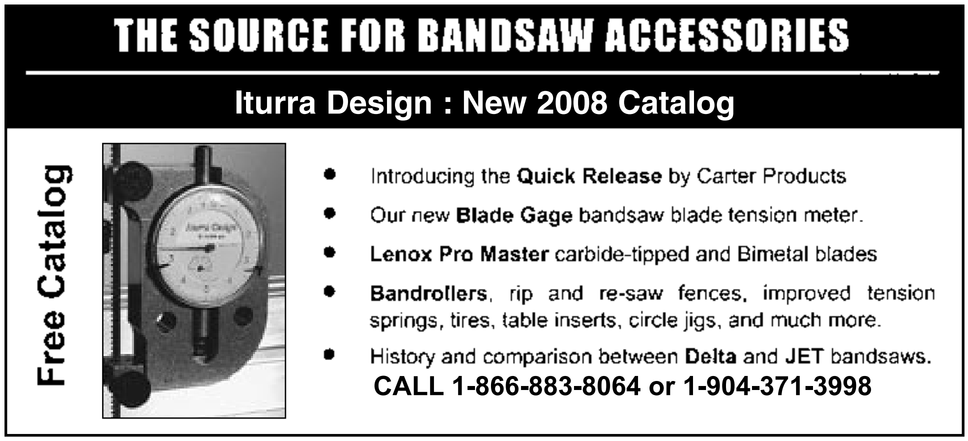

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# My laminated curve is shrinking

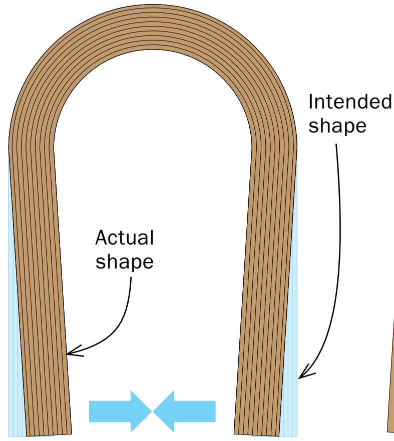
**Q: Two months ago, I laminated a U-shaped curve from approximately 40 strips of 1⁄16-in.-thick African mahogany using yellow glue. The finished piece has a 16-in. radius and 16-in. legs, and is 2½ in. square in cross section. The problem is that the curve has tightened so that the ends of the legs are now more than 2 in. closer together. The lamination shows no sign of slippage. What happened?**

—MARK LAUB, Minneapolis, Minn.

**A:** THE PROBLEM WAS CAUSED by two related factors: too many laminations and the wrong glue. This combination introduced excessive moisture into the wood via the water-based yellow glue. As the water evaporated, it caused the wood to contract. Then the adhesive itself contracted as it continued to harden. To see this happen, leave a few ounces of yellow glue in an old cup and watch it pull away from the sides as it dries.

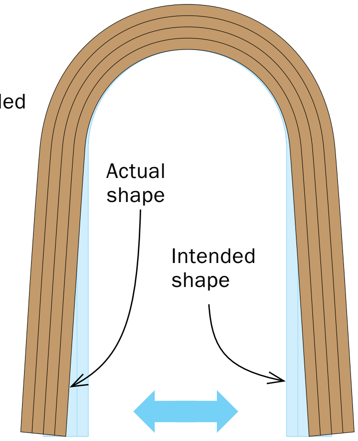
It should take firm hand pressure to bend an individual lamination around the form. If the laminations are thin and too easily bent, then there may be too many and thus too much glue. Alternatively, if the laminations are too thick, there will be a lot of stress along each glueline. Some springback will occur immediately when removed from the form, with continued movement caused by cold creep (the glue stretching). For your curve, I recommend about 26 laminations, each 3⁄32 in. thick.

## PROBLEMS WITH BENT LAMINATIONS




**CLOSE-IN**

If a water-based glue introduces excessive moisture into the lamination, the wood can shrink as the glue cures, drawing the workpiece into a tighter curve.




**SPRINGBACK**

The most common problem with laminations, it is caused by the strength of the individual plies overcoming the rigidity of the gluelines.

A better adhesive than a water-based glue is Unibond 800 (www.vacupress.com), which is alcohol-based and eliminates the moisture shrinkage problem. I apply it with a notched metal spreader made by Hyde, model No. 19120 (www.acehardware-outlet.com). The very small notches leave the perfect amount of adhesive for laminating or veneer work.

Finally, the clamping pressure has to be adequate and consistent. Otherwise, the uneven glueline will promote unpredictable movement.

*—Michael Fortune makes furniture near Peterborough, Ont., Canada.*

## GET THESE THREE FACTORS CORRECT



**1** ***Thickness the plies correctly.*** *You should be able to bend individual plies around the form using hand pressure alone.*




**2** ***Use the best glue for laminating.*** *A two-part urea-formaldehyde glue will not introduce excessive moisture into a laminated part, reducing the chances of shrinkage as the glue cures.*



**3** ***Apple a thin, even coat of glue.*** *Use a notched metal spreader to apply an even coat of glue to each ply.*



Photos, except where noted: Staff; drawings: Kelly J. Dunton

# Why aren't all planes skewed?



**Q: When planing with a normal plane, I always seem to end up skewing it a little to ease the cut. Also, my Lie-Nielsen skew block plane does everything from raising panels to trimming rabbets to paring end grain on small boards. So why don't they make all planes skewed?**

—PEDRO IRAZOQUI, Lafayette, Ind.

**A:** THE SLICING ACTION of a skewed plane, whether the plane is designed that way or is a regular plane used at an angle, lowers the cutting angle slightly and slices the wood fibers, making for a sweeter feel and a superior cut.

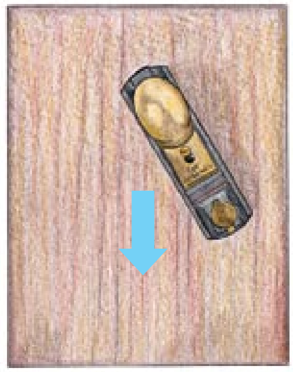
However, when you can skew a plane so easily in use, why build one with a skewed blade, bed, and mouth? (Sharpening is more complicated, too.) The only planes designed with a skew are those that must work in a straight-ahead manner. The Stanley and Lie-Nielsen No. 140 are designed for situations where you can't skew the plane.

*—Garrett Hack is a contributing editor.*

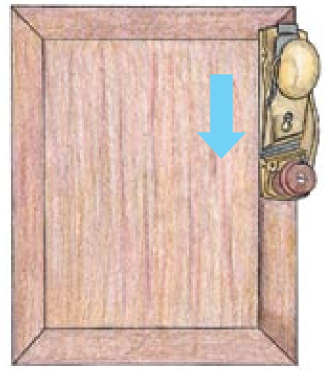


***Uses for skewed planes.*** *These specialty planes are for situations when the tool can be used only in a straight line, such as beveling a raised panel or trimming a rabbet.*

SKEW A STANDARD PLANE WHEN YOU CAN



USE A SKEWED PLANE ON A BEVELED PANEL



master class

# Fine line dresses up a drawer front

BY JEFF HEADLEY



Adding a narrow oval of stringing to a drawer face (see "How to Tackle a Serpentine Drawer," pp. 70-75) will impress woodworkers and friends alike. However, this is a case where less equals more: Lining, a delicate form of stringing, should reward closer inspection of a piece and not jump out at you like white road markings in a car's headlights.

On the other hand, bear in mind that the contrast may lessen as the fine line yellows, and some dark woods, such as walnut, fade with age. With these points in mind, for this piece I selected lining that is 1⁄32 in. thick by 1⁄28 in. wide, the smallest size available from Dover Inlay (www.doverinlay.com; 301-223-8620), but you could go with material as wide as 1⁄16 in.

The distance from the lining to the edge will depend on the size of the drawer or apron. The smaller the piece, the closer to the edge the lining should go. However, when lining a graduated set of drawers, keep the distance uniform on all the drawers. I chose to place the lining 11⁄16 in. from the drawer front's edges, but it will end up a shade under 9⁄16 in. from the inside of the cock beading.

Draw a pencil line 11⁄16 in. from the top and bottom of the drawer front, and then mark a similar distance in from the center of each side. Now connect the side points to the top and bottom lines with semicircles. Do this with a compass, protecting the drawer front by applying a piece of wood or veneer with masking tape.

### Shopmade tools cut the channel

There are a couple of tools to cut the straight sections of the channel in the veneer. You can use the corner of a cabinet scraper with the burr

## Lay out the oval



***Draw two lines parallel to and the same distance from the top and bottom edges of the drawer front. Then mark the same distance from each end. With a compass, draw a semicircle connecting the three lines at each end of the drawer front. Use a thin piece of wood and masking tape to protect the drawer front from the compass point.***



Photos: Mark Schofield; drawings: Vince Babak

# Two ways to cut a straight channel

### 1. SCRAPE

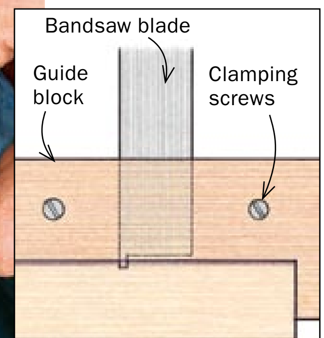
*Hone the burr off a card scraper, sharpen two adjacent edges, and use a corner to cut a channel.*





### 2. SCRATCH

*A section of bandsaw blade filed to a point and held in a shop-made scratch stock is another way.*



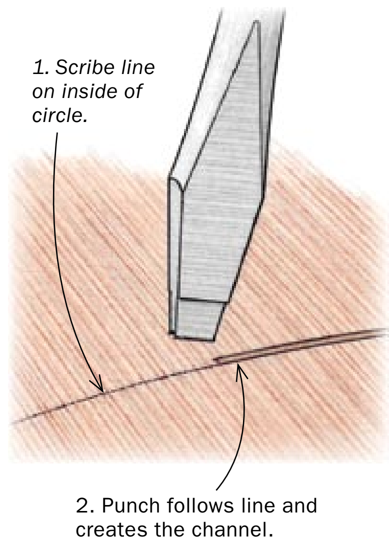

# Cutting a curved channel



***Compass guide.*** *With the sharp point of a compass, scribe a very light line along the inside of the circle.*



***Punch a curved channel.*** *Register a modified screwdriver in the compass line, and cut around the curve with a series of sharp taps.*

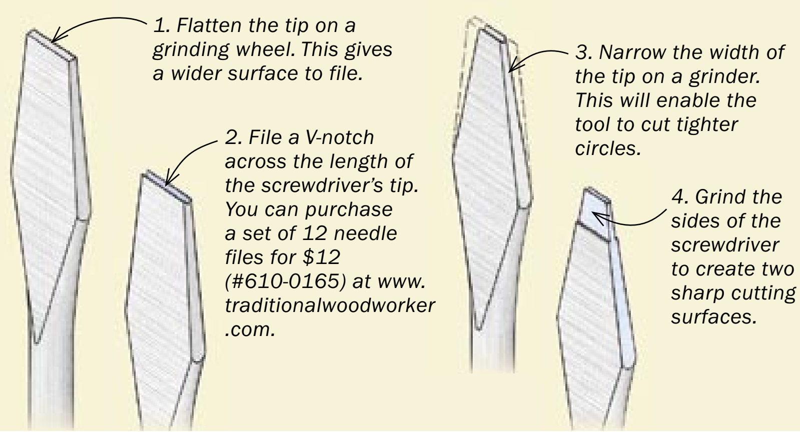



removed. Clamp another drawer-front core to the drawer to act as a fence when scraping the channel. Alternatively, you can use a scratch stock with a built-in fence, with the scraper made from an old piece of bandsaw or scraper blade filed to the correct width.

Cutting the circular channel is more of a challenge. The undulation of the serpentine shape rules out using a laminate trimmer or Dremel-type tool. Simply cutting the wood with a knife would still require the channel to be excavated, while using the point of a compass risks tearing the veneer. I use a tool my father created by modifying a screwdriver (see drawings, right). When tapped, it cuts a channel with clean sides rather than mashing the veneer,

### MAKE A CURVED-CHANNEL CUTTER

**Begin with a regular flat-head screwdriver whose tip is about 3⁄16 in. long.**



## Install the stringing



***Dry-fit the line for length.*** *Fine lining generally comes in yard lengths, so a couple of joints will be required. Cleanly cut joints will be practically invisible once the piece is finished.*



leaving a slot for the fine line. I find it helpful to score a very light line on the inside of the channel using the point of a compass. This gives you something to register the V-channel tool in. Then walk the tool around the circle, giving it a light tap with a mallet at each step. You should aim to create a channel slightly shallower than the thickness of the lining.

### Glue in the stringing and clean it up

Don't worry if your channel doesn't appear machine-made perfect. The lining will spread and expand when pressed home, and scraping and sanding will conceal small voids.

Dry-fit the fine line for length. It mostly comes in yard lengths so you'll probably need a couple of joints. If you plan to have an escutcheon, this can conceal one joint, but if cleanly cut with a chisel the joints are nearly invisible anyway.

Squeeze some Elmer's white glue into the slot and then insert the fine line. Ideally it should sink home by running the face of a hammer lightly over it and not require any clamping. If the fit is a little loose, you can apply some masking tape until the glue dries.

Wait until the next day to scrape off the excess glue and fine line. If you scrape too early when the fine line is still moist, it will shrink as it dries and then will be slightly recessed. This will be very noticeable when the drawer is finished. □



***Insert the lining.*** *The channel should be tight enough so that when the lining is pressed in, it requires no clamping. When dry, use a paint scraper or a cabinet scraper to bring the lining flush with the veneer and remove all excess glue.*



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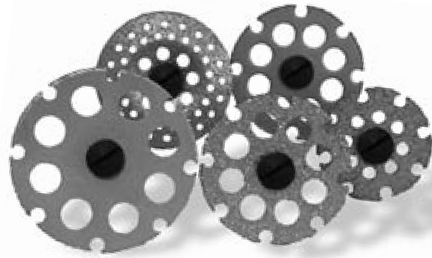
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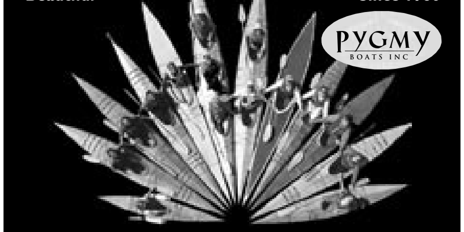
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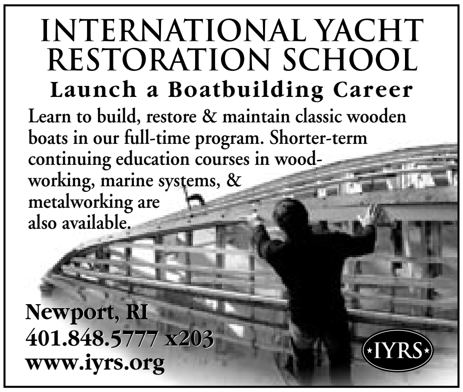








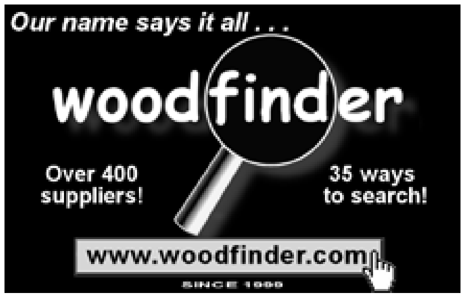
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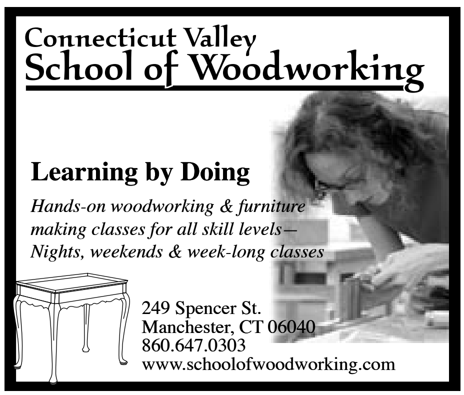



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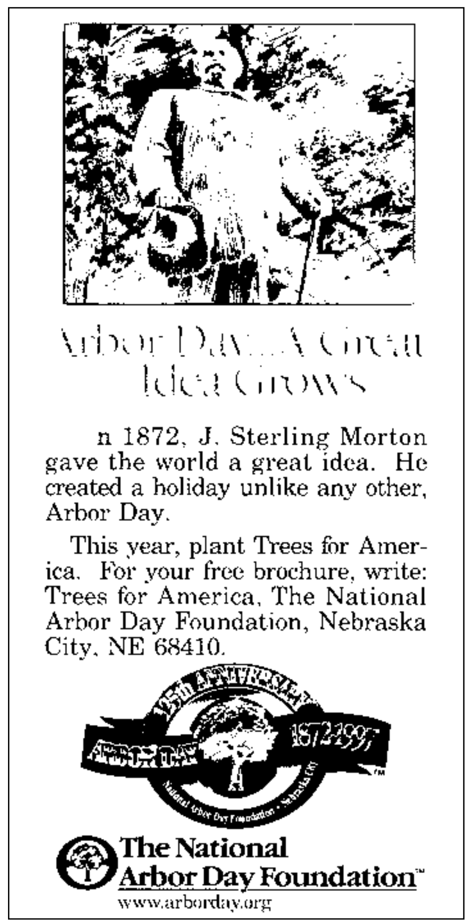

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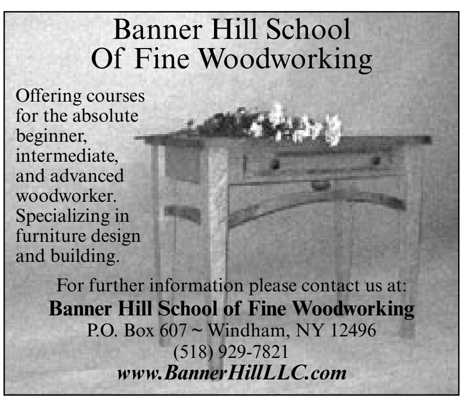


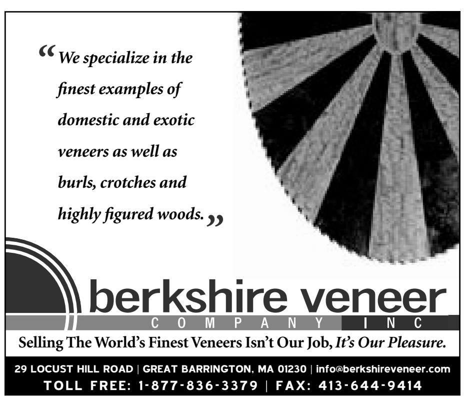

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# how they did it

# Grand illusion on a small scale

BY ANISSA KAPSALES

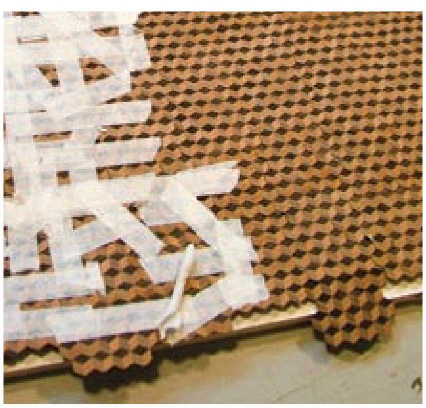
When Joel Shepard began making his Biedermeier-style cabinet (seen on the back cover), he wasn't expecting to use wood to construct the illusion of full-scale rooms in the cabinet's 22-in. by 24-in. interior. But more than 5,000 pieces of veneer later, that's exactly what happened.

After his client decided against a painted interior, Shepard used commercial and handsawn veneers in innovative ways to get the desired effect. As well as employing a woodworker's eye for interesting and contrasting woods, he used lighting and perspective to trick the viewer. The longer one peers into the rooms, the more the details are revealed in the floor, ceiling, wallpaper, wainscoting, frame-and-panel door, and molding.



**MINIATURE MILLWORK** *To create the baseboard and door-trim molding, Shepard stacked sheets of veneer about 20 deep, gluing and clamping them into "lumber," which he then carefully profiled with small router bits and carving chisels. For the wainscoting and door, he applied West African etimoe veneer to a thin core of mahogany before routing the beading on the wainscoting and cutting the tongue-and-groove joinery and raised panels for the door.*





**PARQUETRY FLOOR**
*Shepard combined three woods—mahogany, imbuia, and walnut—to create the pattern on the floor. First, he milled 1⁄4-in. cross-grain parallelograms, and then glued three of them (one of each species) into a hexagonal stick (top). The sticks were glued into bundles of 30 to 50 and resawn into 1⁄16-in.-thick veneers, which form the floor (bottom).*





**ORNATE CEILING AND WALLS**
*Because he was working with a limited amount of madrone burl veneer, Shepard had to be creative about cutting and orienting it. He arranged the ceiling pattern by book-matching, rotating, and piecing the pattern together (top). He achieved the herringbone wallpaper pattern by cutting 1⁄2-in. strips of veneer at an angle across the figure and then book-matching them (bottom).*

Photos, except where noted: Joel Shepard; Rebecca Nelson (top right, top left)


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# The Case of the Cryptic Cabinet





Like the plot of a cunning thriller, this Biedermeier-style cabinet reveals its secrets one by one. From the outside, which is shrouded in etimoe veneer, what looks to be a fall-front turns out to be a pair of flipper doors that whisper open to expose banks of amboyna burl drawers and a mysterious miniature room. Through the frame-and-panel door at the back you see across a tiny hallway to a trompe l'oeil room in marquetry beyond (there is no room there). The portrait is of writer and composer Noel Coward—a clue. What is it about the floor? The geometric parquetry creates a disorienting illusion of depth, and inlaid at the center are crossed fountain pens and the initials J.S. The writing cabinet's owner? Best-selling thriller novelist John Saul. And the author of the cabinet? Furniture maker Joel Shepard. The twists keep coming. The miniature parquet floor folds back to reveal a compartment containing Saul's laptop computer. Three drawers open as one, and out slides a tray for a separate keyboard and a mouse. And a skilled sleuth could find seven other secret compartments. Look past the case and you'll also find a clue to the hometown of both Saul and Shepard.

*—Jonathan Binzen*



Photos: Rebecca Nelson

**How They Did It** Turn to p. 102 to see how Shepard used veneer to craft the moldings, walls, and floor of the miniature room.

**Pro Portfolio** For other secrets and surprises inside this cabinet, check out the slide show at FineWoodworking.com/extras.